ENGINEERING AND MINING JOURNAL

MAY, 1943

MOLTEN MAGNESIUM is purified in pots like this one at the Ontario plant of Dominion Magnesium, Ltd., prototype of several American operations

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In this issue AFTER THE WAR, WHAT?—O. W. Roskill

DOMINION MAGNESIUM—TRAIL BLAZER—R. H. Ramsey

William Embry Wrather, U. S. Geological Survey's New Director

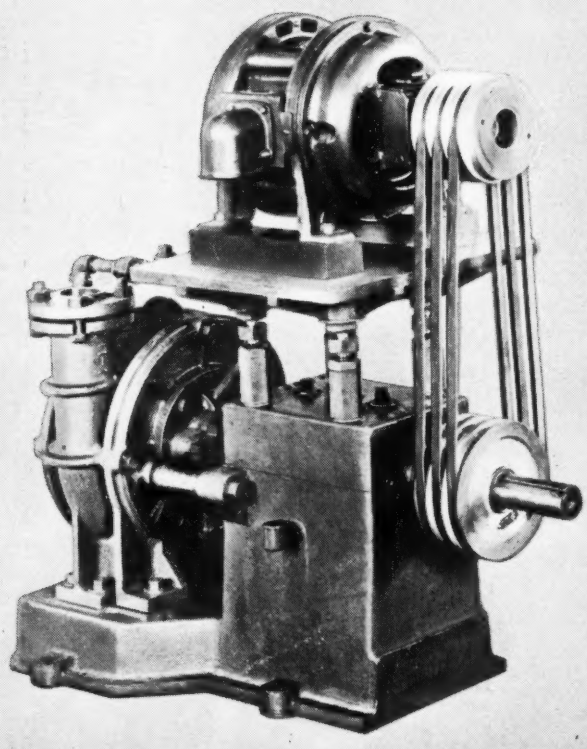
New York State Iron Ores • Channel Irons for Roof Control

Grinding North Carolina Mica

Complete Contents on Page 49

Hydroseal Pumps

FIRST *choice of one of the* "FIRST" *iron mines in the* U. S.



AN iron ore property which supplied metal for cannon and shot in the Revolutionary War is today supplying this critical metal for ships, shells, guns, tanks, etc. This largest iron mine in a certain Eastern State recently built a modern wet mill to beneficiate fines which were previously discarded by their dry well mining of lump ore. All five materials handling pumps in this new mill are Hydroseals. . . . Two Hydroseals in series, each with Overhead Motor Base, handle 412 G.P.M. of solution containing 27 tons per hour of minus 8, plus 10 mesh rod mill discharge middlings, against a total head of 130 feet. A third Hydroseal is piped to serve as a standby for either of those in series. . . . Another Hydroseal with V-belt drive (with a second standby) handles 940 G.P.M. of solution containing 15 tons per hour of minus 8 mesh rod mill discharge middlings against a total head of 69 feet. . . . All solids handled by the Hydroseals are Magnetite Ore having a Sp. G. of 5. . . . If there is a "pumping bottleneck" in your mill caused by too-frequent shutdowns for repairs, write the nearest office listed below for Catalog No. 140; then you supply the Priority and we'll supply the pumps.

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"Longhorn," the name chosen for the new Texas smelter and its tin, honors the famous Texas breed of cattle, now almost extinct. Decorating the smelter office walls is a pair of these horns, displayed like a "trophy of the chase," above an ingot of the tin and a copy of *E.&M.J.*'s Metal Price Chart, according to the editor who went through the plant in a recent week. His first-hand description of this smelter's operations will be published as soon as the manuscript has run the gauntlet of the various officials who exercise the censorship.

▼

Coming also, soon, are several articles on other prominent metallurgical plants. Among the metals thus covered will be zinc, aluminum, and magnesium.

▼

Bagdad—Arizona's latest porphyry copper—began producing in early March, to yield its quota of metal needed for the war. The enterprise, with its block-caving operations and 2,500-ton mill, was recently visited by J. B. Huttl. The story of his trip will be printed in an early issue. Construction of the company's 23,500-ft. tailings line was a major engineering feat.

▼

The Platteville District of southwest Wisconsin, with adjacent parts of Iowa and Illinois, has decades of history behind it as a producer of zinc and lead. Today it is still turning out the concentrates, output being stimulated somewhat by Metals Reserve through bonus payments. A unique feature is that most operators make only a rough concentrate at the mine and sell it to the centrally located custom plant of Vinegar Hill Zinc Co. at Cuba City, which finishes it for market. This company accounts for 80 percent of the district's output. Ray E. Morgan, of Platteville, will discuss the local milling practice in June.

ALFRED M. STAEHLE
Publisher

ENGINEERING AND MINING JOURNAL

R. M. WARD
Manager

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H. C. PARMELEE
Editor

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COVER ILLUSTRATION: MOLTEN MAGNESIUM is purified in pots like this one at the Ontario plant of Dominion Magnesium, Ltd., prototype of several American operations. Photo by MALAK, Ottawa

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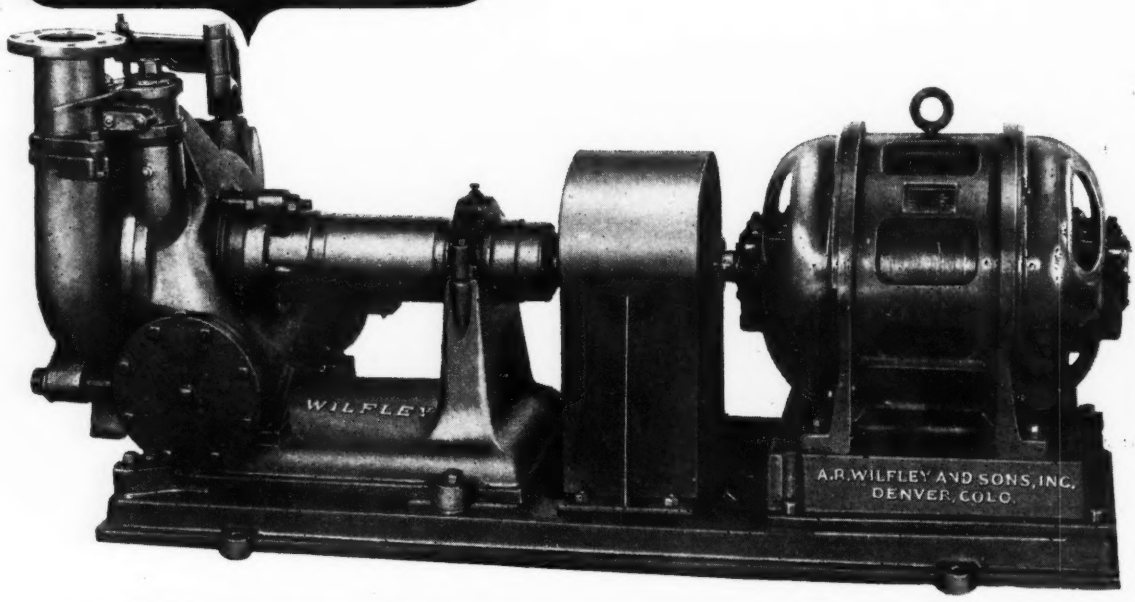

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TRANSPORTATION—a vital war factor

The effectiveness of our armed forces and civilians alike depends on the efficiency of our transportation

As the battle of Tunisia entered its final phases, with the British and American forces joining hands to crowd Rommel into his last fox hole, Hitler and Mussolini held their twelfth war-time meeting.

One important purpose of this meeting, according to the Berlin radio, was the study of a specially prepared "Survey of Continental Reserves". Topping this list of resources is the item of transportation.

Hitler has a great many headaches these days but, according to no less an authority than the Reich Ministry of Economics, "the central problem of the whole German war effort is transportation". It is, in fact, the Achilles' heel of Germany's War Machine.

The Nazis have become soberly conscious of its crucial importance and Mr. Hitler must wince when he recalls the gigantic miscalculations which led him to neglect his railways.

He counted on a short war, not a long wear-and-tear war and Germany's transportation crisis is getting more critical by the hour. It will play a vital part in its defeat.

This is a war of movement—on land, on sea and in the air. Russia's 2,000 mile battleline, R.A.F.'s 700 mile bombing raids, General Montgomery's 1,500 mile advance last November and the vast area that constitutes the theatre of war in the Pacific make this fairly obvious.

Peace will come when one side gets control over the world's supply of fuel, oil and rubber, for on these three critical materials depend all the vehicles of war—as well as of peace.

An army used to travel on its stomach. Today it travels on its fuel tank.

On the home front, transportation is no less vital. Here it is essential in getting the war workers, their raw materials and their products, to and from the mines, mills and factories that supply our armed forces and those of our Allies. Transportation is a major factor in the nation's ability to out-produce its enemies. Every known method, every type of vehicle becomes essential, for no single group of carriers, freight or passenger, can meet all our needs.

The railroads opened the vast resources of our nation and continue to be the backbone of our transportation system. Today they are doing the greatest job in their history. They are hauling more tons of freight more miles than ever before—33% more than in 1941 and 55% more than in 1918, peak year of the first World War. They are carrying more passengers more miles than ever before—80% more than in 1941 and 24% more than in 1918. They are getting more work out of each car, each engine, and each mile of track than ever before. Private operation of railroads is proving far more effective and efficient in this war than did government operation in the last war.

In contrast to Hitler's Germany, the managers of the American railroads have not neglected their plant except where government priorities forced them to do so. They are turning in an unprecedented performance despite the long starvation period to which they were subjected. During the first World War the total investment in the American railroad plant was about $18,600,000,000. Since then $12,000,000,000 have been spent on improvements and after deductions for scrapped facilities the net increase has been $8,000,000,000. Since the present war in Europe began the railroads have invested about $1,650,000,000 in further improvements, many of them to meet special war needs.

Convincing evidence of the railroads' flexibility in meeting the special needs of all-out war is their performance in coping with the movement of oil to the East Coast. In January 1942, one month following Pearl Harbor, the railroads delivered to the East Coast by tank car less than 100,000 barrels daily. By December they had stepped this up to more than 740,000 barrels and during the week ended April 3, 1943 they

This is the eleventh of a series of editorials appearing monthly in all McGraw-Hill publications, reaching more than one and one-half million readers, and in daily newspapers in New York, Chicago and Washington, D. C. They are dedicated to the purpose of telling the part that each industry is playing in the war effort and of informing the public on the magnificent war-production accomplishments of America's industries.

averaged more than 900,000 barrels per day. By the end of this year they are shooting for the goal of one million barrels a day.

Unlike Germany we have not attempted to control the development and growth of motor transportation according to the "intuitions" of one man but have wisely left it in the hands of experienced competition. That is how our highway transportation system came into being. Growing public acceptance has made it an essential part of our national economy.

The motor vehicle, its limitations set only by the improved highway and the supply of fuel and rubber, has developed to undreamed of proportions. Up to a year ago private automobiles consistently moved more people more miles than *all public carriers combined.* Buses have become an accepted means of mass transportation. Local electric and interurban railways in many cases were converted to bus lines and trucks took over the local freight services. Under these improved operating conditions traffic volume increased. When the war in the Pacific made it necessary for us to conserve our supply of rubber and the U-boat depredations in the Atlantic throttled the flow of gasoline to the eastern seaboard, our motor transport was forced to grapple with the toughest problem that ever had confronted it since it became so vital a factor in the every day transportation.

The "share-the-ride" idea recognizes the need of conserving gas, oil and rubber. This particularly applies to buses, for wherever groups can be assembled for a common destination, buses can be used most effectively. The intercity bus performs for the rural areas the same service that the local bus renders for the residential areas of our cities.

Reorganization of railroad schedules, adaptation of motor transport, rearrangement of working hours, all have contributed to provide a flexible transportation service for men and materials to meet the critical needs of the war effort. Twenty thousand intercity buses are handling 635 million passengers a year which is 69 per cent more than in 1941. The fact that these buses carry a relatively larger percentage of the total coach passenger business than their seating capacity would indicate suggests that here, too, we are getting a more efficient use of these vehicles in terms of passenger loads carried. It is fortunate to note that the geographic location of most intercity bus lines does not coincide with that of the railroads but rather supplements it.

The contribution which the urban transport industry is making to the war effort becomes apparent when we consider that buses, trolley buses and street cars today carry passengers at a rate which promises to exceed the impressive total of 21 billions, as compared with 18 billions in 1942 and an average of 13½ billions for the period 1936 to 1941. And this the industry is accomplishing with a minimum of added equipment and despite a serious drain on its manpower.

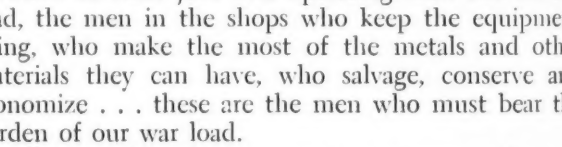
The truck lines, too, are setting all-time records. They have rearranged their schedules, eliminated circuitous routes and coordinated their services with those of other carriers. As this is written, contract truckers with the cooperation of the Office of Defense Transportation are trying to eliminate the empty return trip.

The transportation industry as a whole is face to face with the biggest job in its history. Increasing traffic loads, with little if any new equipment, difficulty in obtaining essential maintenance materials and a growing shortage of manpower, combine to make it that. While federal authorities, acting through the Office of Defense Transportation, took prompt cognizance of this condition, froze equipment and otherwise acted to conserve the vehicles then in service, it was not possible to add sufficient vehicles to keep pace with the increased traffic demand. However, the O.D.T. did lend impetus to the movement for staggering hours of work thereby spreading the peak loads and thus increasing the carrying power of existing fleets of vehicles in city service.

As we review the problems involved in meeting our transportation needs it is evident that we cannot depend upon new equipment alone for their solution. Lend-Lease is taking a considerable share of our much needed output of transportation equipment. The immediate job is up to the rank and file of the transportation industries. It is up to their resourcefulness and devotion to their job. The operating men out on the road, the men in the shops who keep the equipment going, who make the most of the metals and other materials they can have, who salvage, conserve and economize . . . these are the men who must bear the burden of our war load.

Theirs is a dramatic story, a story of cooperation and coordination . . . of ever increasing capacity on a shoestring allowance of new equipment.

For this is a war of movement. According to Joseph B. Eastman, Director of Defense Transportation, both the passenger and the freight traffic on the railroads is to a large extent war traffic – the transportation of troops and civilians on war business, the movement of food, raw materials and finished products required for the prosecution of the war. As Mr. Eastman put it, delayed arrival of troops at embarkation ports, delayed delivery of vital war materials could even conceivably mean the loss of men at the fighting front. And what Director Eastman says of the railroads applies to all forms of transportation. Transportation by bus, by street car, by truck, by train, by ship and by plane . . . all play a vital part in the achievement of victory . . . on the home front and on the fighting front which relies upon it.



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Cartels—Evil or Necessary?

FOR A CONSIDERABLE TIME, and up to the present hour, some government spokesmen, particularly in the Department of Justice, have persistently sought to characterize cartelization as the quintessence of wicked monopolism. Nevertheless, for some time the editors of *Engineering and Mining Journal* have been wondering if there is any reasonable alternative to chaos in the postwar mining world except through cartelization.

Despite the unpleasant connotation of the word, let's be honest with ourselves and take a look ahead. We can expect to come to the war's end with the mining industry, both domestic and foreign, having a productive capacity inflated to nearly double that of peacetime. Potentially competitive to it will be enormous quantities of military equipment to be junked, if for no other reason than because world economies cannot possibly sustain military organizations on the present scale permanently. There will be a colossal task of industrial conversion from a war to a peacetime status. Added to the many millions for whom different jobs must be found will be some millions of soldiers who will rightly demand employment. There will be the difficult job of making the best possible use of thousands of war plants on which billions of dollars of public money have been prodigally spent, as they certainly will not be junked unless the established industrial units against which they are likely to compete present convincing reasons for doing so. Also, we shall have large stockpiles of mineral materials in government hands. It is unthinkable that we can liquidate suddenly all this superfluous productive capacity, with its thousands of jobs, or that government will add to the mineral industry's problems by dumping stockpiles or junk into the markets. When a choice must be made as to which industries to readjust first, it will certainly be much better to carry the mining industry on an inflated basis through the period when the liquidation of the strictly war industries is in progress, than to attempt to continue the production of war matériel to make jobs while shrinking the mining industry to a peacetime status.

Thus the domestic problem, one which will be more or less duplicated in every country now at war. In the foreign field our government is committed to a policy of international cooperation and the encouragement of international trade. To say the least, these policies are going to be difficult to reconcile with the artificial stimulation of domestic industries—and impossible unless international organizations are set up to coordinate national with international problems in the cases of those commodities which, like most minerals, move internationally.

The witch hunt over monopolism has tended to obscure the fact that cartels have operated more to keep marginal producers in business to maintain industrial stability than to wring unholy profits from consumers. The former has been the government's aim in the oil and coal industries. The Department of Justice to the contrary notwithstanding, had it not been for the stabilization policy of the tin cartel, most of the tin production of our good neighbor Bolivia would have been blotted out by competition and would not be able to make its present important contribution to our war effort.

What essential difference has there been between the principle on which the tin cartel has operated and the procedure fostered and directed by our government for the oil and coal industries—administered, curiously enough, by monopoly-hating Secretary Ickes? In these cases the government recognizes and the public appreciates that competition resulting in prices low enough to cause havoc in essential industries is not in the public interest.

How can we carry out the necessary program of preventing catastrophic postwar liquidation of parts of the domestic mineral industry and at the same time fulfill a philosophy of international cooperation except through cartelization, not for the purpose of assuring excess profits but—with government supervision and consumer representation—to safeguard industrial stability and to make necessary liquidations orderly?

Engineering and Mining Journal believes that thoughtful people in both the mineral industry and

government will be deeply interested in the views of Mr. Roskill, presented in this issue. Possibly we are letting crackpots spoil a good word.

A Glance at Mexico

CONFLICTING OPINIONS are heard as to the condition of the mining industry in Mexico. A spokesman for one important group of properties is quoted as saying that the situation is better than it was prior to 1912 (the revolution against the Diaz regime began in 1910). On the other hand, a prominent executive points out that the stringent labor law remains on the books; that its full effect has not yet been felt; that the plight of the National Railways is still lamentable in the face of increased traffic; and that there are various other adverse circumstances. Thus optimism vies with pessimism and causes some confusion.

Thanks to loans and the increased demand for her products, Mexico is experiencing a boom, in which the mining industry participates in no small measure. A buyer awaits every pound of metal that can be turned out. Prices virtually equivalent to the United States market are being paid. This enlarged activity has enveloped an industry that was already struggling with a difficult labor problem, which certainly has not been eased by the resultant boost given to the workman's living cost. Thus the operator still has his troubles, to weigh against his current gains.

The joint committee for economic cooperation set up by the two countries following the recent exchange of visits by their respective presidents will function, it is hoped, to remove at least some of the current difficulties. The flow of strategic materials must not be impeded in any way.

A great gain, as compared with the first World War, is the closer relations between the two republics. Both countries will find it to advantage in the postwar period if such relations can be preserved.

A Senator in Wonderland

TRIPPING GAILY through the looking glass into the realm of science, technology, research, and invention, Senator Kilgore has picked up a weird assortment of notions and has pieced the bits together in a new bill "to mobilize the scientific and technical resources of the Nation." Undaunted by failure to gain the support of responsible scientists and engineers for his earlier bill, S.2721, on which we commented last January, the Senator has revamped his ideas and presented them in S.702. He seems to be retrogressing, because his second effort is less acceptable than his first. Like Alice and the Red Queen, he is probably finding it necessary to run faster and faster in order to stay in the same place. In all sincerity we assured the Senator that his first bill showed a complete lack of comprehension of science and technology and the atmosphere in which they thrive. We reiterate this conviction with respect to S.702, because it abounds in faulty notions. Those who are interested should get a copy of the bill and see what is in store for them under the regimentation and bureaucracy contemplated in Senator Kilgore's blueprint for a scientific and technologic Utopia.

The Totalitarian Trend

IF AND WHEN totalitarianism takes hold in this country, it will not be a matter of deliberate public acceptance. It will come either as the only way to quell civil disturbances—not so remote since the recent coal strike—or as a creeping disease.

There can be no better barometer of totalitarian trends than the freedom of the press. Totalitarianism cannot endure free speech or a free press, and the extent to which our government indulges in curbs on freedom of expression not absolutely vital to security is a sure indicator of the growth of this loathsome disease.

Believing this, we are profoundly disturbed over several events of recent months. We know now that our highest officials solemnly uttered falsehoods about Pearl Harbor. We know now how the Tokyo raid was publicized as a complete success, although it was more or less of a Pyrrhic victory. Some of us wonder at the manner in which the execution of the captive raiders by the Japs was announced, with an air of profound shock, despite the fact that the news had been known for six months and confirmed for six weeks. Also, we wonder at the unnecessary passion for secrecy over the planned food conference.

Many of the releases put out by the Office of War Information are sugar-coated stuff, suspiciously similar to what one would expect from a "Ministry of Propaganda and Public Enlightenment." The resignation of 15 newswriters from this agency in a body because of the inflow of "public relations" men into key positions is ground for alarm. Nobody who has met Elmer Davis believes that he has any desire to become a Goebbels. However, agencies have a disconcerting way of developing trends not intended by their organizers or bosses.

In view of these circumstances, we believe that it is high time for the public to become concerned over the evidence of "creeping totalitarianism." It would certainly be a miserable tragedy if we at home should lose by default the precious liberties we tell the boys at the front they are fighting for, and for which the heroes of innumerable past generations have died.

William Embry Wrather

Introducing

the Geological Survey's New Director

EMINENT in his profession as a consulting petroleum geologist, William Embry Wrather, of Dallas, Texas, comes to the Directorship of the United States Geological Survey with the recommendation of several outstanding scientific organizations, including that of the National Academy of Sciences, a gratifying circumstance. His appointment, made by the Secretary of the Interior, who is also Petroleum Administrator, at a time when new discoveries of petroleum have been disappointingly small even as the demand for petroleum and its products has reached staggering proportions, will seem to many to have an especial significance. The varied activities of the Survey, we feel, however, will one and all receive the attention due them, in proportion as they require it under the wartime conditions prevailing. Mr. Wrather is credited with high administrative ability as well as sound technical and scientific competence. Secretary Ickes is to be complimented upon the wisdom of his act.

Mr. Wrather was born at Brandenburg, Ky., in 1883. He studied at the University of Chicago, where he also did post-graduate work. Although his 25 years as consultant have been largely spent in petroleum geology, his knowledge of the entire field of geology is widely recognized. At the time of his appointment he was serving as Associate Chief of the Metals and Minerals Division of the Board of Economic Warfare. His career has been distinguished by a number of other interesting appointments.

As representative of the National Academy of Sciences and the National Research Council Mr. Wrather was present at the 14th International Geological Congress in Madrid in 1926. Three years later he attended the 15th International Congress in Pretoria, South Africa. He helped organize the 16th Congress that convened in Washington in 1933 and was delegate to the 17th that selected Moscow, in the Soviet Union, for its meeting place in 1937. At Chicago University's 50th anniversary he was awarded the alumni medal for notable work in geology.

In the Geological Society of America Mr. Wrather has served as Councilor from 1928 to 1930; as vice-president in 1932 and again in 1936; and on its finance committee from 1932 to 1936 and from 1939 to date—an important appointment by reason of the Society's endowment of several million dollars.

Under the administration of Mr. Wrather, the Geological Survey can be expected to maintain its record for high accomplishment and to meet such problems competently as a changing world may thrust upon it.

Reflections from Washington

Washington News Bureau

CIVILIAN SUPPLY has become the No. 1 problem in Washington. Spurred by the threat of Congressional action which would set up a civilian supply administration outside of WPB, Donald Nelson, WPB chairman, in mid-April appointed a new vice chairman, Arthur D. Whiteside, to take charge of civilian requirements. Mr. Whiteside is no stranger to the national capital. In his new position he gives to civilian supply an able champion who knows the devious ways of bureaucratic Washington and who can shout on equal terms with the Army, Navy, and other claimant agencies for the things necessary to keep the industrial plant going—if he gets a clean bill of authority with which to work.

New Additions to WPB

IN ANOTHER quick move WPB Chairman Nelson asked the President to add three important government officials to WPB. The appointments of War Manpower Chairman McNutt, Office of Defense Transportation Director Eastman, and Petroleum Administrator Ickes followed promptly. This generally was taken as a move to strengthen the Civilian Supply sector, as the civilian needs cut sharply across the agencies headed by the new board members. Though the common assumption may be perfectly true, the move brings into the WPB fold three outside autonomous agencies and gives them a common meeting ground short of the White House which they have not had before. By so doing it removes for the time being the threat of the formation of some over-all agency or super war cabinet that might be interposed between the President and the War Production Board.

Civilian Supply Essential

CIVILIAN SUPPLY is to receive greater attention than in the past, regardless of the niche in which it winds up in the Washington bureaucracy or who heads it. In 1942 emphasis was on immediate increase in production of military items. Today the civilian side is assuming greater importance because a breakdown in the civilian economy could be fatal to the war effort and because the demand for some war materials can be expected to diminish after the channels of supply are filled. The meaning of civilian supply is not solely goods sold at retail at the corner store. The term also refers to the production of non-military items purchased by mines, mills, and factories in the regular course of their business to be used as operating supplies and for plant maintenance.

Months ago, topside officials of WPB realized that the non-military program had to be planned and scheduled along with the military program in order that the country's war production effort could function with the greatest efficiency. Plans to that end are being carried out.

The stated policy has been to give repair and maintenance high rank in the distribution of materials. Result in the mining field has been the revision of repair and maintenance orders not only to permit orderly scheduling of production of repair parts and replacement items but also to permit forward planning so that action on the civilian industries is in step with military production.

Though the forward thinking elements of WPB are now considering plans for demobilization and reconversion of industry, high officials of the armed services are issuing warnings that the load is to become heavier instead of lighter. At one of his press conferences, Under Secretary of War Patterson warned, "The idea that equipping the Army is nearing completion is wholly unfounded. The job of furnishing our armed forces with their requirements is a job that will grow until the peace conference." A similar view was expressed by General Somervell, addressing the U. S. Chamber of Commerce meeting in New York on April 27.

The cleavage between civilian war officials in Washington and the armed services was further illuminated on April 27 when Donald Nelson testified that the aviation gasoline shortage was due to miscalculations by the military planners, not to competitive efforts by Rubber Administrator Jeffers, which they had blamed.

The fundamental reason for the differences in viewpoint is that, with lives and the country's safety at stake, the armed services view anything short of an abundance of material for all possible exigencies as an undersupply, and deprecate any coddling of civilians, whereas the civilian officials and Congress see no point in being so thoroughly cautious at the risk of undermining civilian economy and morale.

It is greatly to the credit of the principals involved in this controversy that at no time have they permitted the struggle to degenerate into a personal quarrel. People throughout the country were heartened by the announcement early in May that a basis for accord had been reached and a joint tour was planned.

Mine Pump Order

MINE PUMPS have had their production and distribution put under strict control by Limitation Order L-246. This order makes no change in the procedure operators follow to secure new pumps or repairs. Application for priority assistance should be made according to the provisions of Order P-56, which governs maintenance repairs and operating supplies for mines.

Order P-56 states: "Notwithstanding the provisions of any other order or regulation of the War Production Board, no producer shall acquire any mining machinery or equipment, or maintenance, repair, or operating supplies through use of a preference rating or other form of priorities assistance assigned otherwise than pursuant to this order or an order in the P-19 series."

Unless the material sought is covered by a particular "L" or "M" order, mine operators must use P-56 to secure maintenance supplies whether the mine holds a serial number or not. New mining machinery or other capital equipment, such as pumps, require a written application describing the equipment desired and giving the reasons why it is essential to the proper operation of the mine. The Mining Equipment Division, if it grants requests for priority assistance to acquire new pumps or repairs costing more than $500, will grant a high enough priority to meet the requirements of Order L-246 for an approved purchase order, and to secure the equipment in competition with other purchasers.

Under the terms of L-246 the minimum rating of an approved purchase order is raised to AA-5. This restriction does not apply on orders for repair parts amounting to less than $500 for any single pump or 50 percent of the original sales price of the pump to

be repaired. Emergency ratings will be provided in cases where an actual breakdown has suspended or threatens to suspend operations.

Gold mines operating under special relief from Order L-208 must obtain materials by express permission of the Director General for Operations. (Apply to Mining Equipment Division, WPB under par. C of that order.)

New Survey Director

CONFIRMATION of the appointment of William Embry Wrather as director of the Geological Survey marks the first time in the history of that organization the post has not been filled by a man from the ranks. But as Mr. Wrather pointed out, "In the 25 years I have spent as a consulting geologist I have worked constantly with the Geological Survey and we are anything but strangers."

When asked by the *E.&M.J.* representative about his plans for the future, Mr. Wrather replied: "The Geological Survey is a government organization that is deep in direct war work. That work must be continued at top speed. Changes, if any, will be for the purpose of making the war work of the Survey more effective. The only other thing that I can say at this time is that I shall do my utmost to maintain the scientific integrity of the organization."

Mr. Wrather went to his new assignment from the Board of Economic Warfare, where he held the position of associate chief of the Metals and Minerals Division. His professional work has been largely in the field of petroleum geology, but he is recognized for his wide understanding and appreciation of the entire mineral field. His name was proposed by a committee of the National Academy of Sciences as a man of high administrative ability as well as possessing technical and scientific competence.

International Currency

EARLY IN APRIL Secretary Morgenthau disclosed the broad outlines of the plan the Administration has been "cooking" to provide a basis for international currency stabilization after the war. Primary purpose of the plan, according to Morgenthau, was to facilitate world trade after the war by preventing exchange fluctuations.

The plan, similar to that proposed by Lord Keynes and purporting to represent the British point of view (*E.M.&J.*, April, p. 81), provided for a central international bank, to which the United States would advance five billion dollars in gold as a reserve, and new units of international currency to be known as "Unitas." The principal difference between this plan and that advocated by the British was that the Keynes plan would set up a clearing house bank, whereas the U. S. plan contemplates a capitalized bank with the United States having a compelling influence. It was widely rumored that the Administration was reluctant to disclose its international currency plans at this time and did so only because the British "jumped the gun."

Principal significance to the mining industry is that the largest gold-owning nation and the greatest gold-producing empire are getting together to rehabilitate gold as currency, which is something of an about face from the tactics that both have followed during the past decade. The announcements also suggest that the two countries are jittery over the prospect of postwar currency chaos due to competitive devaluation.

Reciprocal Trade "Whitewash"

AFTER A WEEK of hearings on the proposal to renew the Reciprocal Trade Act, on April 26 the House Committee on Ways and Means voted by a small majority to comply with the Administration request for another three-year extension of the act. All proposed restrictive amendments were rejected by the committee, and only one, entirely acceptable to the Administration, although characterized as superfluous, was adopted. This amendment gives the President discretionary power to cancel concessions in cases where the items in question are affected by the activities of international cartels. Adoption of the amendment suggests congressional approval of the witch hunt the Administration has been conducting with reference to monopolistic practices and is of particular interest to the mining industry, because, as discussed elsewhere in this issue (pages 51 and 62), there is some reason to believe that cartelization may be the only way of preventing chaos in the postwar mining world.

Led by Secretary Hull, the Administration adopted the strategy of broadcasting to the world that rejection or restrictive amendment would be looked upon by our allies as proof of our intention to readopt an isolationist philosophy. This was a dangerous strategy, as if Congress should "call the bluff" and make amendments designed to curb some of the excesses and inconsistencies which administration of the reciprocal trade policy has developed (see *E.&M.J.*, April, p. 78), it would amount to official Executive admission that we are "going isolationist." However, the Ways and Means Committee did not choose to call the bluff, and the strategy of tying the whole issue to one thought provided a convenient umbrella under which the State Department could shrug off detailed or minor criticism.

Assessment Work Suspended

ON APRIL 26 the Senate passed and sent to the White House the McCarran resolution extending the expiration date to July 1, 1944, of the suspension of assessment work requirements on mining claims now in effect. The President signed the bill on May 4.

Bolivian Troubles

THE BOLIVIAN EMBASSY in Washington has announced that the martial law imposed in the mining districts of that country has been lifted. Labor disturbances which were interfering with the production of strategic materials needed by the United Nations were the stated cause. (*E.&M.J.*, Jan., 1943, p. 42.) Constitutional government has now been restored throughout the nation.

One of the causes of labor unrest has been that a price increase on tin concentrates was not passed on to the workers in the form of higher wages. Probably this was made impossible because of the need for mining lower-grade ores in order to supply the demand; also because the government found it necessary to absorb a good portion of the benefits in the form of increased export taxes. In Bolivia, with only about 10 percent of the population drawing wages, and the Chaco War to pay for, the government is almost forced to use the export tax as a primary source of revenue. (More information on the Bolivian report is given on p. 90.)

"Hold Line" Order

PRESIDENT ROOSEVELT'S "hold the line" order was the most important political event during the month of April. There was no change of policy to be found in the statement of the chief executive. The importance of his utterance was that it was the firmest statement he has made on the subject and that it was made while the Bankhead and the Pace farm "grab" bills were still pending in Congress and in spite of the snarls and growls coming from John Lewis.

The strategy of the move is obscure, particularly in view of the fact that the echoes of the statement had scarcely died away before his lieutenants, Secretary Perkins and Conciliator Steelman, were seeking a back-door escape from the order, to appease the coal miners. Some feel that the stand taken by the President is one from which he cannot retreat. This probably is underestimating his agility. It is safe to assume, however, that he has less room in which to maneuver. It has

(*Continued on page* 126)

DOMINION MAGNESIUM— Trail Blazer

Canada's Pidgeon process, model for several American operations, taps vast reservoir of light metal

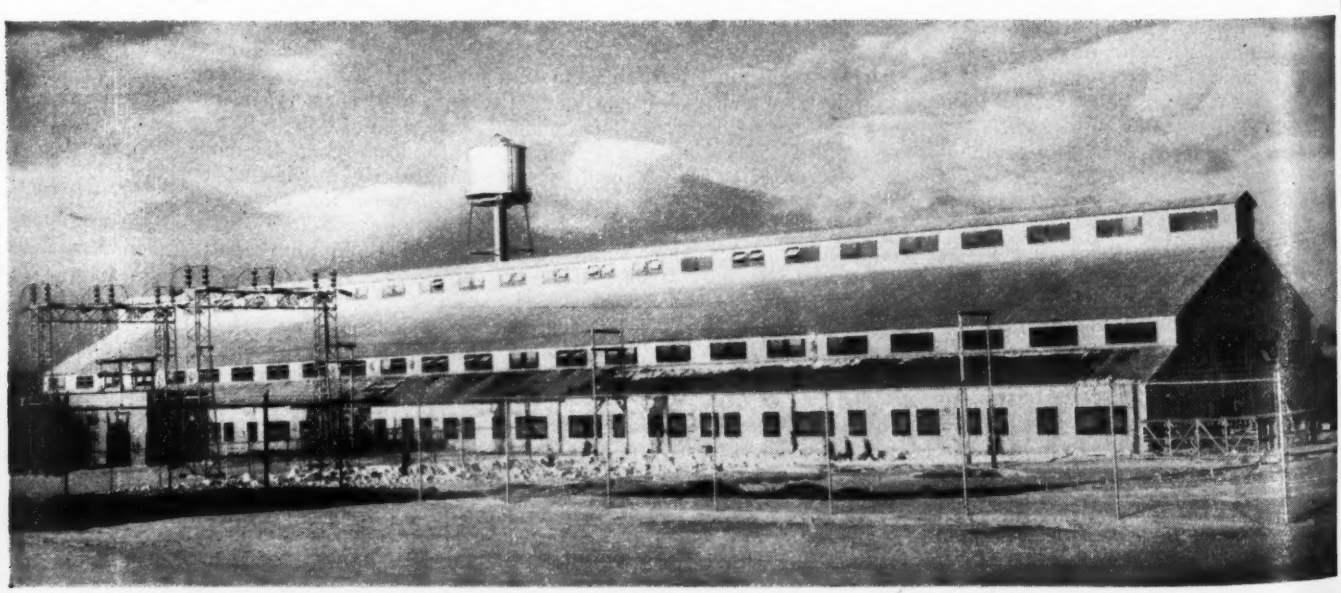
All photos by MALAK, Ottawa

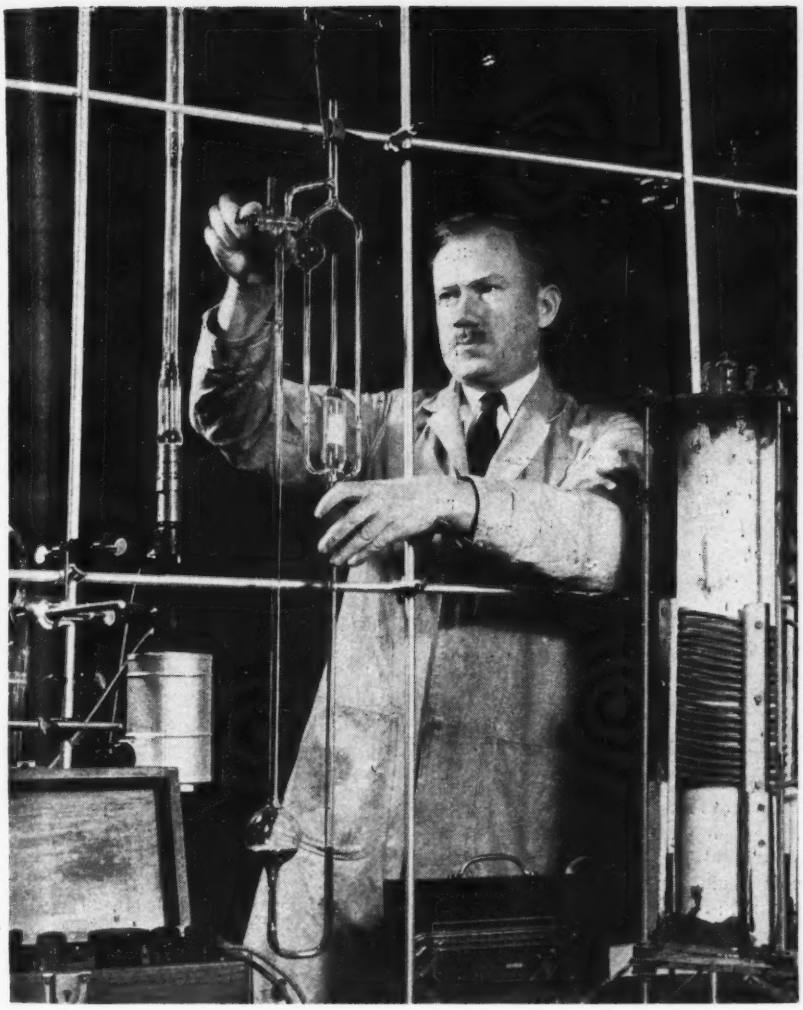
R. H. Ramsey, *Assistant Editor*

WHEN THE WPB asked the War Metallurgy Committee to recommend a magnesium process best suited for supplying our vastly increased demands for the metal, a rapid but intensive investigation of all available facilities ensued. Best answer to our problem, said the Committee, lay in a process recently developed by a Canadian chemist named Pidgeon, and about to be launched commercially by a group of Canadian mining men in cooperation with their government. Dominion Magnesium, Ltd., as this enterprise was called, therefore is the first of a series of Canadian and American operations now using Dr. Pidgeon's process for magnesium by ferrosilicon reduction of dolomite. Aside from this fact, the Canadian plant also merits attention because of its clean design and its ability to turn out magnesium ingots with little more fuss or commotion than one might find in the neighborhood bakery.

This smoothness in operation was not attained overnight. The first step was taken in 1937, when Lieut. Gen. A. G. L. McNaughton, now Commander in Chief of the Canadian Army, in his capacity as director of the Canadian National Research Council, assigned Dr. L. M. Pidgeon to work out a magnesium production method using Canada's own raw materials. The National Research Council is a government-financed group somewhat similar in its aims and methods to Mellon Institute or Battelle Memorial Institute in the United States. Dr. Pidgeon, a graduate in chemistry of Manitoba University with further research work at McGill and at Oxford behind him, has been with the Council since 1933, working on various electrochemical problems, and his first efforts with magnesium production dealt with electrolytic methods. He soon became convinced, however, that for Canada's purposes electrolysis presented serious disadvantages and thereafter worked

DOMINION MAGNESIUM, LTD., in Ontario, Canada, was first large-scale producer of magnesium by Dr. Pidgeon's ferrosilicon process. Its plant presents spic and span exterior to passerby; interior is equally clean, and, more important, safe for workmen





FERROSILICON REDUCTION of dolomite to produce magnesium metal was made a commercial possibility by Dr. L. M. Pidgeon, here seen setting up a McLeod gage in his pilot plant. WPB chose his process as model for much of U. S. magnesium plant expansion

exclusively on thermal methods. The accompanying timetable shows the progress of his work, which reached its culmination in February of 1943, when the final unit of Dominion Magnesium's plant was brought into production. All that now remains is a process of tuning up, which is being carried on in both plant and laboratory. Production increases daily as a result of it.

A discussion of magnesium electrolysis is not within the scope of this article, but a short review of the chemistry of thermic methods is valuable in considering the Pidgeon process. That thermic methods are at all applicable is due first to magnesium's boiling point of 1,120 deg. C., and second to the fact that magnesium does not form a carbide. Aluminum boils at 1,800 deg. C. and does form a stable carbide, which explains why no other method for aluminum but the electrolytic has appeared in the last 50 years.

The general reaction for producing magnesium metal by direct reduction is as follows:

$$MgO + X \rightleftarrows Mg + XO$$

The reaction, considered as written, is endothermic and will proceed to the left, usually violently, unless (1) a sufficiently high temperature is maintained; (2) X is not volatile, Mg is volatile, and provision is made for rapidly removing the Mg from the system. Of the several reducing agents available, only carbon, silicon, and calcium carbide are worthy of serious consideration under present conditions. Aluminum could be used satisfactorily, but it would be uneconomic at present to use one badly needed metal to produce another, unless no other means were available. The accompanying chart shows the reaction involved in each case and a consideration of each shows why Dr. Pidgeon chose silicon as the reducing agent with which he was to work.

With regard to carbon reduction, at all temperatures between 400 deg. and 1,800 deg. C. the reaction proceeds to the left, and because both right-hand products are gases, it is impossible to prevent this reversal by removing the Mg vapor alone from the system. Hence, shock cooling of these products must be resorted to; they must be reduced as nearly instantaneously as possible to a temperature below 400 deg. C. in order to recover any metal at all. This has been accomplished in practice in the Hansgirg process by spraying the hot Mg and CO vapors into 20 or 30 times their volume of cold hydrogen or natural gas. A small amount of MgO inevitably is produced, but the greater part of the magnesium metal is recovered as a fine powder, which is thereupon briquetted and distilled to produce the pure metal. The formation of this extremely pyrophoric magnesium powder is inevitable in this method because, in shock-cooling, no definite lower temperature limit can

SEQUENCE OF EVENTS IN DOMINION MAGNESIUM'S DEVELOPMENT

1933—Dr. L. M. Pidgeon joined National Research Council of Canada

1937—Magnesium research initiated by Lieut. Gen. A. G. L. McNaughton

Jan. 1941—Magnesium produced by Pidgeon process in 4-in. laboratory retort

Mar. 1941—Dominion Magnesium, Ltd., formed to built pilot and full-scale plants

May 1941—Pilot plant in operation with one large retort

Oct. 1941—Pilot-plant work successful

Nov. 1941—Engaged John Mitchell for general plant design, and Singmaster and Breyer, of New York, for design of retort furnaces and furnace-room layout

Jan. 1942—Pilot plant visited by engineers of U. S. Bureau of Mines and by committee of WPB. Recommendations made to build similar plants in U. S.

Feb. 1942—Construction of Ontario plant begun

Aug. 1942—First magnesium ingot poured in Ontario plant

Feb. 1943—Ontario plant attains full production

be set and magnesium condenses in a massive form only at a carefully controlled temperature of over 300 deg. C.

Calcium carbide would be a suitable reducing agent, if only one volatile product (Mg) were formed, because of the low heat required for the reaction. Against this factor must be balanced the probable reagent cost. A comparison with the third reaction shows that to produce 1 gram mol. of magnesium, 14 g. of silicon are required as against 64 g. of calcium carbide. Because of this unfavorable economic factor and because the presence of carbon as an end product might result in the formation of CO, calcium carbide was not considered a suitable reagent at present.

Silicon, in the form of the commercially obtainable ferrosilicon, was selected as the reducing agent to be used in Dr. Pidgeon's work. The heat balance of the silicon reduction is much less unfavorable than in the case of carbon, and, because the volatile magnesium could easily be removed, all possibility of reversal of the reaction could be avoided. Because ferrosilicon must first be made, the ferrosilicon method, as compared with the carbothermic method, also requires two steps, but can be so operated that no dangerous products are handled at any point. This was felt to be a great contributing factor to ease of plant operation and simplicity of design.

The reaction on which Dr. Pidgeon based his work is not new; in fact it was used years ago to produce small amounts of magnesium for laboratory use. In a compendium of information on magnesium written in 1929 by engineers of I. G. Farbenindustrie and issued in English translation by J. A. Hughes & Co., Ltd., London, the ferrosilicon reduction of magnesium is described; but it is stated that no suitable apparatus has been devised for its commercial application, though the impression is given that I. G. Farben could do so if it wanted to. Dr. Pidgeon's contribution has been to remove this reaction from the realm of laboratory curiosities, clothe it in everyday dress, and put it to work in our war effort.

First of all, Dr. Pidgeon found that ordinary refractory materials were unsuitable for constructing retorts for ferrosilicon reduction of magnesia. They all entered into the reaction, if only as contributors of sodium or potassium. These alkali metals are also liberated by ferrosilicon and condense with the magnesium, but unlike the latter, they flame up when the retort is opened. The burning sodium invariably touches off the surrounding magnesium, and the metal is thereby lost.

After considerable research, Dr. Pidgeon found that the reaction temperature could be lowered and that metal retorts could be built to withstand the necessary temperature over long periods.

Second, it was learned that careful control of the condensing temperature must be exercised in order to secure a dense, coherent deposit of magnesium which would not ignite spontaneously upon removal from the furnace. To insure removal of the magnesium vapor to the cooler part of the retort, a vacuum is maintained therein; and the metal is easily removed when the reaction is complete. A further refinement is a means of separating any volatilized sodium from the magnesium. Almost all available raw materials contain some sodium, which is released in the reaction. Mica, for example, is reduced by FeSi. On opening the retort the condensed sodium is allowed to burn harmlessly in the air and no magnesium is ignited.

Use of pure magnesia from brucite or magnesite is neither necessary nor desirable. The reason is that as soon as SiO_2 forms it will combine with any MgO present to form $MgSiO_3$, a silicate which has a low melting point. Fusion of this silicate effectively ties up a large part of the available magnesium, prevents the required heat transfer, and also makes difficult the removal of sinter from the retort. It has been found that most efficient operation is obtained only by using calcined dolomite as the raw material. In a mixture of CaO, MgO, and SiO_2 under the conditions of this process, CaO will displace MgO from $MgSiO_3$ and practically none of the latter compound ever forms, providing enough CaO is present. The dicalcium silicate formed has a high melting point and does not fuse at the reaction temperature. The briquets, therefore, hold their shape and are easily removed from the retort when the reaction is complete. The actual reaction in the retort may be expressed as follows:

$$2(MgO.CaO) + Si \rightleftarrows 2Mg + 2CaO.SiO_2 - 57 \text{ kg.cal.}$$

Thus plants using the Pidgeon process are not tied to relatively rare high-grade magnesite or brucite deposits. Reasonably pure dolomite is common in many parts of the country, and the location of a Pidgeon process plant is therefore almost independent of raw material considerations and may be chosen on the basis of power or labor factors alone. The site of the original plant described in this article was chosen because of its favorable location in the Ontario power network; so far as raw material is concerned, a number of other dolomite deposits would have served equally well.

The plant of Dominion Magnesium,

COMMERCIAL MAGNESIUM PRODUCTION BY THERMIC METHODS OFFERS THESE CHOICES

I. Carbothermic Reduction

$$MgO + C + 119.2 \text{ kg.cal.} \rightarrow Mg + CO$$

For:	*Against:*
Low cost of carbon.	Difficulty of separating two gaseous products.
High capacity per unit.	Shock cooling produces highly inflammable magnesium powder.
Possibility of continuous operation.	High reaction temperature required.

II. Calcium Carbide Reduction

$$MgO + CaC_2 + 8.9 \text{ kg.cal.} \rightarrow Mg + CaO + 2C$$

For:	*Against:*
Low heat requirement.	Relatively large amount of carbide required for reaction.
One vapor (magnesium) formed.	Possibility of carbon monoxide forming from hot carbon and lime

III. Ferrosilicon Reduction

$$2MgO + Si + 92.92 \text{ kg.cal.} \rightarrow 2Mg + SiO_2$$

For:	*Against:*
Medium heat requirement.	Relatively high cost of ferrosilicon.
One vapor (magnesium) formed.	Large number of small furnace units required.
Dolomite used as raw material.	

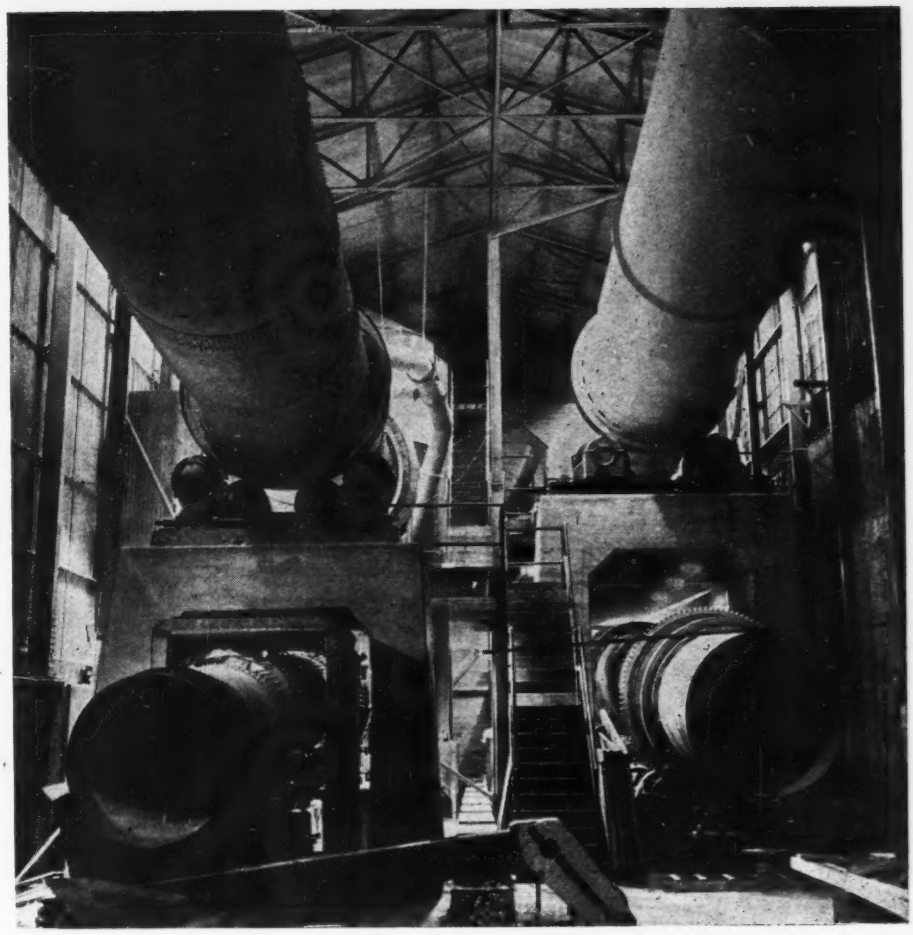
Ltd., was built in a rather sparsely settled part of Ontario in the center of what was a none-too-productive bean field a year ago. The adjacent dolomite deposit is an outcrop of the widespread Grenville limestone series. Extensive drilling before work began showed a close approach to the theoretical composition of dolomite, and the greater part of the samples taken contained less than 1 percent insoluble material. Development work thus far on this "orebody" indicates a length of 1,200 ft. and a width of 300 ft. of unvarying purity; depth has not been measured. J. D. Barrington, plant manager and an ex-gold miner, finds the mining part of his new venture somewhat boring and is often tempted to report to the head office a vein of high-grade just for old times' sake.

Rock is now being broken by three men working only on day shift. Two 20-ft. benches are being driven, and drilling is done by one Ingersoll-Rand drifter on wagon mounting, and by two small plugger drills. Air is provided by an I-R compressor at the plant site. Broken rock is loaded by means of a ½-yd. Austin-Western shovel into one of two 4½-ton trucks for haulage to the crushing plant. This shovel is smaller than units in most quarries of this kind, but the higher speed in loading has proved advantageous here. In addition to the shovel operator, one man is employed to oil the shovel and to aid in breaking rock fragments too large to handle immediately.

A short haul brings the trucks to the crushing plant, where the loads are put through a grizzly into a 28x36-in. Traylor jaw crusher set to give a 4-in. product. Crushed rock goes over a 4-mesh Tyrock screen, the undersize going to a bucket elevator and the oversize to a Bonnet hammermill for reduction to minus 4 mesh. The elevated 4-mesh product passes through a Raymond "Whizzer" air separator, which removes minus-100-mesh material, and is then stored in fine-ore bins as potential kiln feed.

Two rotary calcining kilns, made by Vulcan Iron Works, are installed, but only one is in use. Coal is used as fuel, and a Raymond bowl pulverizer grinds the coal in preparation for combustion. The hot calcine leaving the kiln passes through a short rotary kiln, which brings it down nearly to room temperature.

A diesel engine-generator combination is kept standing by for use during power failures, so that the rotary kiln can be kept turning over. Power cutoffs cause little hardship in the rest of the plant, for if furnace temperature drops or vacuum is broken, the magnesium reduction reaction merely stops until the power is turned on again. There is no danger connected with a power failure other than that of damage to the kiln.



HUGE ROTARY KILNS burn dolomite in Dominion Magnesium's plant to form calcium and magnesium oxides which are reacted with ferrosilicon to yield magnesium metal. Calcine is cooled to room temperature in lower kilns

The cooled calcine is finely ground in a Raymond roller mill in closed circuit with an air classifier and is then stored in bins, from which it is drawn in weighed amounts to be mixed with the ferrosilicon.

Lump ferrosilicon, purchased in the open market, constitutes the heaviest item of operating expense. Arriving at the plant in large chunks, it is broken up in a small jaw crusher, ground in a 4x4-ft. ball mill in closed circuit with a Hum-mer screen, and stored in bins alongside those containing the calcine.

Calcine and ferrosilicon are weighed out in suitable proportions, and each batch is mixed in a Sturtevant mixer and then put through a Komareck-Greaves briquetting machine. No binder is used at present because none has been found which did not have a bad effect on the subsequent retorting.

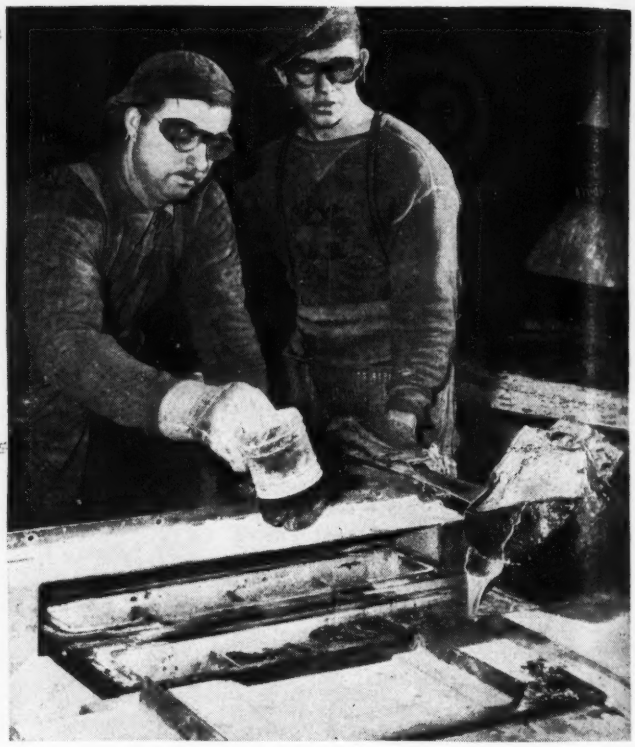
The briquets are passed over a Tyrock screen and all undersize is returned directly to the briquetting machines by a screw conveyor. The screened briquets drop into small bins which act as feeders for the next step.

Below these bins are placed wheeled racks, each one carrying metal canisters about the size of a carbide can, which are filled in turn with the briquets. The racks are then pushed into an adjacent coal-fired tunnel kiln, through which they pass by displacement. Purpose of this preheating is to drive off any water in the briquets and to aid in maintaining an even retort temperature.

The furnace room, into which the canisters are then hoisted by one of two 3-ton Northern cranes, contains a double row of furnaces. From the front of each furnace project the ends of the retorts with vacuum pipes attached. The two overhead traveling cranes serve one furnace line each and are constantly running up and down the line bringing fresh canisters or removing spent briquets. Eight men, working in pairs, charge and discharge the retorts, and remove the collected magnesium "crowns," as they are called.

Sequence of operations is about as follows: fresh canisters issue from the drying and preheating kiln, and each crane picks up half of them. The charging crew meanwhile has spotted a charging car in front of a group of retorts. The crane dumps the canisters into the bins of the charging car, and the two men of the charging crew then ram the briquets into the retort as they drop through a movable gate out of

STIRRING UP TROUBLE, if they're not careful. Crude magnesium from retorts is melted and purified in this pot by stirring flux through melt. Molten magnesium ignites readily; hence extra man douses small fires with dry flux



CASTING MAGNESIUM is easy when properly done. Here one man pours metal into molds which other man dusts with sulphur. Consequent presence of SO_2 prevents oxidation of magnesium. Mold is usually covered while pouring

the car bins into a trough beneath.

After charging, the men roll the car aside and clamp a cover over the mouth of the retort while the vacuum line is open. Once the vacuum is restored inside the retort the clamps are removed, for no ordinary effort can thereafter budge the cover until the vacuum is again broken.

Eight hours later, almost to the minute, the group of retorts will be ready for discharge. The vacuum line is closed, the covers are removed, and the magnesium is pulled out. The red-hot residue, still in briquet form, is raked out of the retorts into a long steel tub which the crane man has just placed there. The retorts emptied, the crane takes the tub of glowing briquets down to one end of the furnace room to be dumped, while the charging crew rolls up the charging car with a fresh load. Thus, each retort is charged and discharged three times in 24 hours.

It has been found best to run this part of the process on a more or less inflexible schedule; that is, each group of retorts is discharged at a certain definite time which is designated in advance and is known to both crane man and charging crew. Each man in the furnace room, if he can tell time and has a watch, knows exactly where he should be and what he should be doing at each minute during his working period. This does not mean he must work furiously every minute, but he does know when and where there is work to be done.

Experiments show that in 8 hours practically all the easily recoverable magnesium is obtained, and to make the highest possible recovery would require a long and uneconomical additional heating period. Therefore, retorts are arbitrarily opened after 8 hours, whether or not the reaction is complete. Only in this way can smoothness of plant operation be attained. Incidentally, completeness of the reaction is not judged by the amount of magnesium left in the residue, but by the amount of unreacted ferrosilicon left behind. FeSi is the more expensive component of the charge and is therefore regarded more highly. The spent briquets are sampled and discarded, no further use having been devised for this material.

The recovered magnesium is trucked to the melting room for the final step in the process. At this stage the exterior of a crown resembles a section of concrete pipe, but the interior is one silvery, costume-jewelry sparkle of magnesium crystals. At no time in handling these crowns is there more than a flare or shower of sparks as an occasional crystal catches fire.

The retort furnaces, of a unique design worked out by Singmaster & Breyer, of New York, are heated by globars, silicon carbide bars laid under the retorts. Power is supplied to these elements through transformers so arranged that the secondary voltage may be varied. This facility is required because the resistance of the globars increases with age and corresponding adjustments in applied voltage must be made. They are arranged in matched sets of like resistance, and if any one bar varies too widely from the group resistance, it is removed and placed in a set matching it. Globar heating provides a remarkably steady, uniform heat, and all aspects of its use have thus far been entirely satisfactory. P. A. Bennett, chief electrician, and two helpers watch over this end of the operation.

Vacuum in the retorts is maintained by vacuum pumps, and three manufacturers, Stokes, Beach-Russ, and Kinney, shared in providing them. An experienced technician is in charge of these pumps at all times, and, because excellent maintenance and supervision are given, they have operated satisfactorily.

Control of the furnaces is secured by recording and regulating instruments made by Leeds & Northrup Co. Temperature-sensitive devices are installed in the furnaces and are connected to L. & N. recording meters. Temperature regulation is secured by using a vacuum tube circuit in connection with separate meters for each furnace. Change in temperature causes a corresponding change in the vacuum tube circuit, and the required adjustment in the globar circuit is automatically made. Similar instruments, including an ingenious new instrument which is sensitive to changes in degree of vacuum, are used for control and

adjustment of the vacuum line to the retorts. Operation of the retorts in so far as temperature and maintenance of vacuum is concerned is largely automatic.

In five months of operation no trouble has been experienced with globar heating or with vacuum pump operation. In the first few weeks, however, some of the retorts were found to be sagging and a few collapsed altogether. The sagging retorts were straightened by subjecting them to internal air pressure for a few hours, a practice which is still found useful at times. The collapsed retorts were found to be thin-walled at the point of collapse, and care is now being taken to produce retorts of uniform dimensions. Aside from these difficulties, the retorts have run five months with no apparent harm and may continue indefinitely. Constant temperature, of course, adds to the life of both retorts and globars, and every effort is made to avoid shutdowns and consequent drop in temperature.

When a hand-truck load of magnesium collects at the furnace room it is wheeled out to the melting room, where it is weighed and dumped into one of three melting pots. Cast from a low-carbon steel, these pots are corroded by the magnesium and are replaced when the original bottom has become too thin. The pots are sunk into the floor, projecting only a foot or so above floor level, and are heated underneath by oil burners. Pits are dug below each pot to confine any metal which might in some way escape. A temperature sufficient to melt the crowns is maintained, but it is not closely regulated.

A fourth pot, much smaller, contains molten flux. All ladles, bars, and paddles used on molten magnesium are dipped in the flux before use. This protects the steel tools and prevents magnesium from adhering to them. The solid flux, as a powder, is dusted over the molten magnesium in the melting pots and is also stirred through it as a purifier. Use of the flux over the metal is apparently not so much to prevent fire as to prevent a slower oxidation and loss of metal. A few white flares or small snapping flames appear on the metal surface as it is stirred or as ladles dip into it; but quite often clear, uncovered molten magnesium may be seen and no fire results. This usually surprises visitors who think of molten magnesium as being extremely touchy. Unquestionably there is danger of fire, but a quick dusting with flux puts out each flame as it starts, and for the rest, pouring magnesium is no more exciting than pouring lead, and a ladleful certainly weighs a lot less.

When a full charge of metal has melted, flux is stirred through it in order to pick up impurities, which consist largely of magnesium oxide and smaller amounts of silicates of calcium, magnesium, or iron. The resulting "slag" is heavier than the magnesium and collects in a thick sludge on the bottom of the pot. Dominion Magnesium practice is to ladle out this sludge before pouring the magnesium. It is accomplished by two men, one of whom scoops a ladle full of sludge off the bottom, then carefully pours back the metal also picked up, the second man completing this operation by skimming the last bit of metal from the ladle. Sludge is dumped into pans and discarded, and so far it has not been found profitable to rework it.

Immediately after all the sludge is removed, pouring begins. Two men, in turn, dip ladles into the molten metal and pour it into one of a rack of molds centrally located in the melting room. The molds are arranged in an endless chain and as each mold reaches the pouring point, it passes under a plate, which covers it, leaving only a small opening through which the mold is filled. Each mold has been dusted with sulphur, which starts to burn as the metal enters, forming a protective reducing atmosphere over the magnesium as the mold travels along the rack. At the end of the rack, the now solid magnesium ingot drops out onto a conveyor which moves it to the shipping room.

The melting and pouring operation proceeds 24 hours a day, but weighing, inspecting, and shipping of ingots are done only on day shift. Each ingot is trimmed of excess metal by a small air hammer and is then weighed and inspected by a government representative, who stamps the weight and a number on each ingot. The steady stream of silvery ingots dropping from the melting room conveyor is indeed a pleasant sight to one who appreciates the use to which the metal will be put. Exact figures cannot be given, but this plant's substantial tonnage is divided among flare, incendiary bomb, and airplane manufacture. The bombs and the bombers, and the light to show them the target, are all from the one useful metal.

The many ferrosilicon plants now operating, or under construction, in the United States are similar in essentials to the Dominion Magnesium plant. with the exception that none of them uses the globar furnace heating method. Use of natural or producer gas has been found more economical under domestic conditions where electrical apparatus and power are both at a premium.

Managerial personnel of Dominion Magnesium, Ltd., is as follows: President, R. J. Jowsey; vice president and managing director, W. E. Segsworth; manager, J. D. Barrington; assistant manager, H. B. Megill; plant superintendent, J. P. Dick. Dr. L. M. Pidgeon is consulting metallurgist, and Singmaster & Breyer, of New York, are consulting engineers for the company. I wish to thank Mr. Jowsey both for his permission to visit the plant and for his hospitality while I was there, and Mr. Barrington, who explained the operation to me. I also wish to acknowledge the friendly courtesy of Dr. Pidgeon, who showed me his pilot plant and explained its operation.

THE MAGNESIUM INGOTS shown stacked up in this photograph could, if made into incendiary bombs, just about supply a full load for a Flying Fortress headed over Germany. Inspected, weighed, and sampled, these bars are ready to go to war

After the War, WHAT—in the Mining Industry?

Cartelization seems unavoidable if the Atlantic Charter is to be fulfilled

O. W. Roskill
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THOUGH there are still differences of opinion on questions of principle, it has been characteristic of the trend of thought since the war began that broad agreement on general objectives has become increasingly assured, and the Atlantic Charter is an illustration of this. It is, however, in the detailed application of these objectives that most divergence is likely to arise, and unless the fullest possible attention is given in advance to their application, breakdown may well result.

War-Time Controls—After the last war much pressure was exerted with the object of securing the removal of controls at the earliest possible moment, and this pressure achieved its object. The atmosphere was one of attempting to get back quickly to prewar methods of trading. Many of the present controls, both national and international, have probably come to stay. There is therefore little point in discussing the relative merits of controlled economy and a return to *laissez faire*. It is, however, of the greatest importance to insure both that the objectives of such controls are clearly stated and understood and that their mechanism is such that they are able to attain these objectives in a straightforward way.

Price Fluctuation—A striking feature affecting the production and trade of the vast majority of raw materials and foodstuffs prior to the war was the great price fluctuation to which they were subjected. This applies even to metals like lead, where some degree of international cooperation between producers existed. Many have a clear memory of long-term changes in price, for example the catastrophic decline in 1929-30 and the marked recovery from 1933 onwards, but few realize that even in one year there were fluctuations between the minimum and maximum price, often over 50 percent and sometimes as much as 100 percent. These price fluctuations were the source of the greater part of the profits of many merchant firms, and it is no exaggeration to state that merchant firms in general have a vested interest in the maintenance of price fluctuation.

Changes in Marketing—Once nearly all the chief metals were bought and sold on commodity exchanges throughout the world, mainly the London Metal Exchange. A fall in price below a certain level resulted in higher-cost mines closing down, so that supplies coming on to the market were reduced. It is true that there has always been a considerable time lag, particularly in the mining industries, except perhaps in the case of certain marginal cost producers, such as the North African lead-zinc mines. A rise in price brought increased production and resulted in release of stocks held by speculators. The price of the metal quickly and more or less accurately reflected supply conditions.

But in recent years many changes have taken place in this mechanism. The major part of the sales of the chief metals is no longer made on a commodity exchange but directly by the producing company to the consumer, or more often by a selling agent acting on behalf of several companies. And the lower the proportion of total consumption bought and sold on the exchange, the less accurately does the price reflect true supply conditions. The change will probably be accentuated by the fact that sales are increasingly concerned with quality more than price. Oxygen-free copper and "four nines" zinc have passed beyond the stage when they can be satisfactorily traded at a fixed premium above ordinary brands.

Increased Unit Size—Another factor is the increased average size of producing companies. Excluding the U.S.A., which stands in a special position as regards nearly all metals, 60 percent of the total world output of copper (blister basis) in 1938, namely 1,630,000 short tons, was accounted for by ten companies (A.B.M.S. figures). In the case of pig lead, in the same year ten companies produced 52 percent of the world output of 1,499,000 short tons outside the U.S.A. The corresponding figures for ten of the leading slab zinc producers outside the U.S.A. were 53 percent of a total of 1,295,000 short tons. The figures for each of these metals are even more striking if the percentage of world exports accounted for by the chief companies is considered, rather than production. It is, moreover, obvious that problems of international organization arise mainly where surpluses are produced for export and are not of importance where the output is locally consumed. This is one of the reasons why little practical progress can be made in international organization of the metal industries until a policy has been formulated in regard to the postwar position of Germany, one of the biggest world fabricators and consumers.

Of the major metals only in the case of tin was the average output per company far smaller, and the effect of this was largely offset by the intense concentration of smelting: 77 percent of the world smelter output of 165,300 long tons in 1938 was smelted by three companies and their subsidiaries.

Prices, Costs and Output—A group comprising 50 to 60 percent of the total output of a commodity is far from exercising complete control, as the history of "restriction" schemes has

FRAMEWORK FOR POSTWAR MINING

as seen in the Atlantic Charter

THE "CO-MAKERS" of the Atlantic Charter, the time, and the place. President Franklin D. Roosevelt and Prime Minister Winston Churchill, somewhere at sea, August, 1941. Associated Press photo

Article 4. They will endeavor, with due respect for their existing obligations, to the further enjoyment by all States, great or small, victor or vanquished, of access, on equal terms, to the trade and to the raw materials of the world which are needed for their economic prosperity.

Article 5. They desire to bring about the fullest collaboration between all nations in the economic field with the object of securing, for all, improved labor standards, economic adjustment and social security.

shown. Moreover, in the past restriction schemes have generally been designed to keep prices up at levels which can be considered unjustified only by comparison with costs of production of the lower-cost producers, capable, if permitted, of meeting the entire world demand. These are the circumstances in which "outsiders" flourish, which, from the consumer's point of view, is a good thing.

Is it too optimistic to wonder whether the increased government influence on control schemes which is almost certain to be exercised after the war in the interests of consumers and in conformity with current trends of political thought will not have among its main objectives the fixing of price levels which are "reasonable" in relation to production costs? If such a course is attempted it is clear that it will lead to a situation in which high-cost companies and countries may be faced with a demand from the controlling international governmental authority for a price level lower than that at which they are able to produce without loss. Either, therefore, the price must be raised to a level at which they can continue, which is inimical to the interests of the ultimate consumer and therefore to world interests as a whole, or the company or country must cease to produce. It has been commonly assumed that the interests of the ultimate consumer are served by the lowest possible prices. This assumption is not universally accepted, but it is worth pointing out that discussions on the subject in the metal industries are sometimes obscured by the fact that producers of raw non-ferrous metals tend to think of consumers as the manufacturers and fabricators to whom they sell, and to hold the view that low prices for their metal tend merely to swell the profits of the manufacturer. It is impossible to discuss this point fully, though it may be pointed out that low raw material prices in the past have often failed to benefit the ultimate consumer as they should, sometimes owing to monopolistic conditions in the manufacturing industry, sometimes owing to inefficiencies in distribution. On the other hand, the prices of many fabricated products—e.g., copper tubes—are tied by a formula to the price of raw metal. What is certain, however, is that no policy aimed at securing the lowest possible price for raw materials will benefit the ultimate consumer, and the world at large, if the benefits of low prices are not passed on by manufacturers.

Closing High-Cost Producers—High-cost producers go out of business regularly, and there would be nothing novel in a company having to shut down because it could not produce economically at the prevailing price. If, however, the number of units so affected is large and they are concentrated in a single country, in the economy of which they may form an important part, social disruption and, therefore, political complications are likely to follow. If not provided for in advance, these complications might be quite sufficient to torpedo the whole scheme. Bolivian tin is an obvious example, but the position of the Belgian custom smelters of zinc and lead, with their huge ore imports from Mexico, Australia, Burma, and Sweden, in the case of zinc, and Yugoslavia, Bolivia, Sweden,

LOADING BLISTER COPPER at Chanaral, Chile, for shipment to the United States. Excluding the latter country, 60 percent of the world output in 1938 was accounted for by ten producers. Three Lions photo

Australia, etc., in the case of lead, might also lead to difficulties.

Redundancy Schemes Essential?—It may prove impossible to operate any international control schemes unless redundancy schemes are incorporated in them—i.e., schemes whereby if any existing producer has to be eliminated he receives, for a period to which a limit is set, compensation out of the profits of those who remain in operation to an extent not less than the estimated benefits he would have received had he continued to produce. This sounds very like the payments for not producing hogs made in the bad days between the wars, but it seems to be the only way of bringing about what must be one of the main changes in postwar compared with prewar industrial organization—namely, binding social and economic affairs together more closely and preventing industry from escaping its share of responsibility for clearing up social dunghills which it may have brought into being. Whether it is a derelict coal-mining town in one of the valleys of South Wales, developed as a home for coal miners and derelict ever since the coal seams ran out, or a future derelict lead-zinc mining town in the Tri-State district, or a whole country which may largely depend on mining one ore at a cost above world levels, there are human as well as economic effects of decline and decay, and to provide for them is as much a duty of industry as to put guards over machine tools and to insure against accidents in the works. In international industries such as those of the nonferrous metals, obviously such provision must be on an international basis as an integral part of any control organization. Social conditions in Bolivia must become a concern of the Malayan tin companies. If, as seems possible, world aluminum capacity greatly exceeds demand in the immediate postwar years, with the U.S.A. in the forefront of low-cost producers, the American industry will have to take a lead in looking after the isolated communities in, say, Norway, largely dependent on a single aluminum works operating on too small a scale and with too distant sources of raw materials to enable them to compete. The prosperous industry of today may be the lame duck of tomorrow.

Price Stabilization—Returning to price fluctuations, it will be admitted that these are scarcely in the interests of consumers, except perhaps those who sought to make up for lack of profits from manufacture by speculative profits on their raw material. The technique of price stabilization is now fairly well known—a combination of:

(a) The periodic fixing of output levels for each mine or smelter, as the case may be, in relation to its capacity;

(b) The holding by an independent body with representation from the industry concerned, of a buffer stock which is built up in times of declining demand and released in times of increasing demand. Such a stock enables the impact of declining demand on the producer to be buffered and permits supplies to be released in times of increasing demand, perhaps more quickly than output can be raised, so that there is no danger of consumer going short.

Past experience suggests that price stabilization in this way cannot be operated unless there is an element of compulsion behind the scheme, owing to difficulties (already mentioned) encountered with "outsiders." One possible solution has been indicated on the foregoing that in times of reduced demand the controlled price must be lowered to a level little above or even below the cost of production of the lower-cost producers. Under such circumstances there would be few outsiders wishing to share adversity.

It must be realized by persons unfamiliar with the economy of mining that if prices were really related to costs of production there would be a tendency for prices to rise as output expands, because it would be necessary to bring higher-cost producers into operation to meet the demand. Also, a policy of relating prices to costs of production needs certain special qualifications which are peculiar to the metal and mineral industries. In the first place, there is the question of development expenditure. There are many examples of mines where large return on capital has been obtained.

British Trend of Thought—It seems to be agreed that the extent of compulsion should be minimized in the postwar organization of all industries, but some further thought needs to be given to this whole question. That some discipline is necessary for the enjoyment of freedom is axiomatic; the most spacious hall has its steel frame or its walls of brick. Turning

for a moment from the international field to present-day Britain, a strong trend may be observed which for want of a better description may be called Syndicalist. A memorandum entitled "A National Policy for Industry" recently issued by 120 leading industrialists, though in restrained and cautious wording, pointed strongly in the direction of building up more powerful and representative "sectional associations," in some cases by adapting existing trade associations and industrial and export groups. It is perhaps worth reproducing the purposes which these associations are intended to fulfill:

1. To promote the production of a maximum output at the lowest possible price consistent with the adequate remuneration of labor and capital.

2. To establish a greater measure of collaboration, both within the trade and with other sections of industry, in the interests of efficiency and therefore of service to the consumer.

3. To encourage such forms of industrial competition as are conducive to the public interest: conversely to discourage wasteful and destructive competition.

4. To establish contact with any bodies representative of the consuming public or sections of it and to take account of any representations which may be made in regard to the quality or price of manufactured products and their method of distribution.

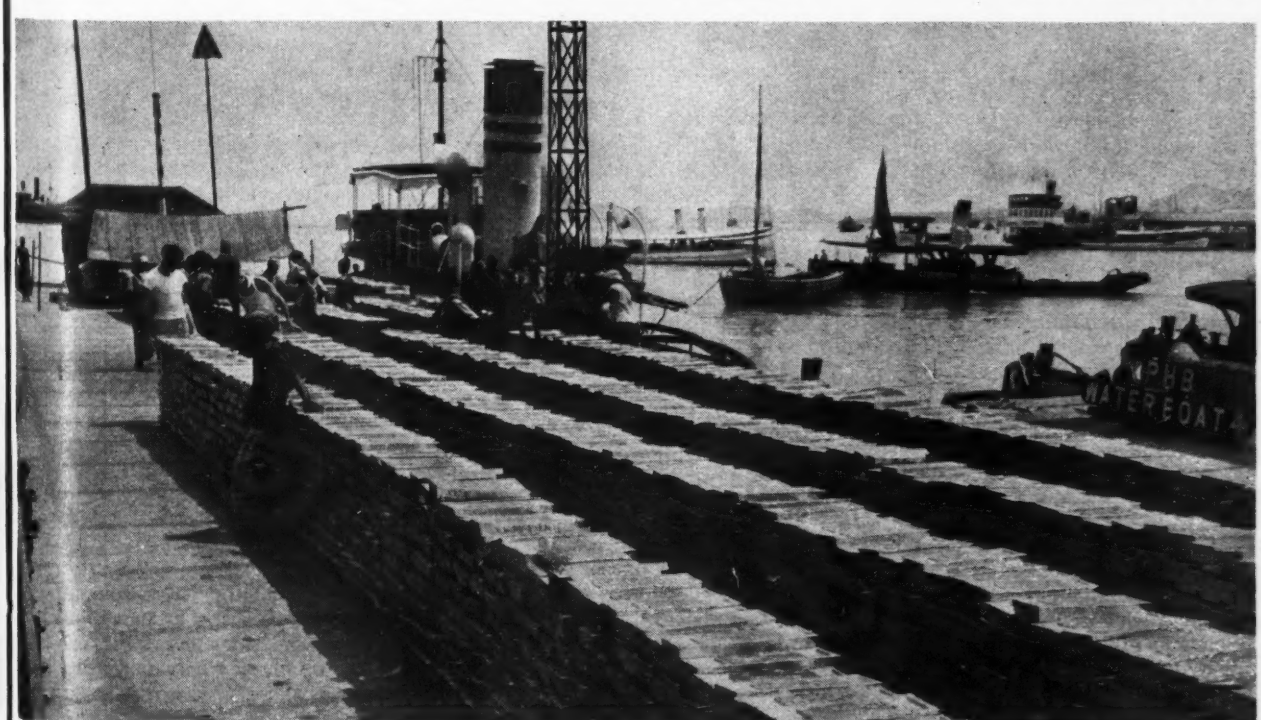
5. To adopt standards of wages and conditions of service which pay full regard, so far as lies within their power, to industry's aims as indicated in section 1.

Few could quarrel much with this broad outline of the functions of a trade association except perhaps item (3), as industrialists have a tendency to think that active competition in their own fields is wasteful and destructive. The councils of the association just described would elect a Central Council of Industry. On the specific question of whether the association should have compulsory powers to enforce its decisions, the authors are inclined to hedge and to propose a committee to investigate the matter, but they do seem to contemplate compulsion, inasmuch as they suggest the setting up of an "Industrial Tribunal or Commission" to act as a Court of Appeal on industrial matters.

More Powers to Industry?—This digression may be excused because the document quoted is one of the few authoritative British proposals for postwar industrial structure, and, if adopted, would influence the international organization of the metal industries, and secondly because it has been strongly criticized. The criticism seems to foreshadow a split between those who want a tighter, more closely knit structure in each industry, probably with compulsory powers, though duly safeguarded, and those who go to the opposite extreme and demand an anti-monopoly drive and the creation of a British Thurman Arnold. Basically, the controversy involves the relation of government, as the representative of the consumer, to industry. British industry could make out a convincing case that the history of government understanding of or legislation for industry is scarcely inspiring. There are many industrial problems which cannot be understood except by those who have worked in industry, and the civil service is, by and large, at a disadvantage in this respect. In some cases problems are brought in to the political arena and become a target for lobbyists and politicians, when, considering only the interests of consumers, they could have been best dealt with by the industry concerned. But to take an important part of the powers and duties of government and hand them to industry would be far more dangerous, and so far as can be forecast, this is not likely to happen in postwar Britain even if an anti-monopoly drive is no less improbable. Similarly, in the international field of the metal industries the industries concerned may be responsible for technical matters relating to production, distribution, and probably also sales development, but policy, including the level of output and prices, seems likely to be formulated by the governments of the producing countries concerned, probably also with representation of the governments of leading consuming countries and advice by the industry.

Full Employment—One of the principal postwar problems, to which attention is already being directed, is that of maintaining full employment, and there are certain international implications of steps likely to be taken in this direc-

PIG TIN stacked up on a Penang wharf awaiting shipment, before the Japanese invasion. At this time production in Malaya as in other countries was closely controlled by the International Tin Committee. **Photo by Alfred T. Palmer**



tion which require consideration. Sir William Beveridge's social security scheme, which has stimulated public feeling in Britain to a greater extent than any other prospective postwar change, is based on the assumption that unemployment can be regulated so that it does not average more than 8½ percent. Having finished the preparation of his social security scheme, Sir William is now working on the problem of the maintenance of employment. One of the best contributions to postwar reconstruction, and a much more convincing document than "A National Policy for Industry" referred to, is a pamphlet issued by Lever Bros. and Unilever, Ltd., in January 1943 entitled "The Problem of Unemployment." It is impossible to summarize the arguments of this pamphlet regarding the purpose of economic policy, the relation of unemployment to the trade cycle, and the prospects of controlling the trade cycle, but a few points bearing on the arguments put forward here may be mentioned. The authors hold that though centralized planning of consumption is utterly opposed to individual freedom of choice, central planning for provision of new capital equipment must be undertaken, owing to the effect of irregularity of capital investment in the past as the real cause of unemployment. There is little doubt that plans will have to be evolved in advance for the capital equipment of new mining undertakings, so that the work can be undertaken at times best suited to controlling the trade cycle. On the other hand, the authors reject the idea of placing compulsory powers for corporate organization in the hands of individual industries or of industry as a whole, and feel that it would lead to a new type of privilege no matter what safeguards were introduced. They advocate division of the budget into two parts, one that is balanced annually and one providing for normal capital expenditure plus all emergency measures to be taken in times of depression to fight unemployment or stimulate trade.

The authors point out that any attempt to regulate productive activity in one country can be frustrated by events in others, and that no lasting success can be expected without some coordination of social and economic policy in the international sphere. They advocate, under the aegis of the Atlantic Charter, the conclusion of international agreements superseding the lease-lend agreement, and the setting up of international bodies to effectuate them. One general objective of such agreement would be to protect countries that embark on schemes for fighting unemployment and creating social security against competition from those which do not. The prevention of social unrest is undoubtedly a paramount condition of a lasting international peace.

International Agencies—The technique of joint international economic agencies has been developed, particularly by the British and U. S. governments, since the war. A review of this trend is not feasible, but apart from U.S. and British external agencies whose activities are more or less closely coordinated with each other's (such as the Office of Lend-Lease Administration, Board of Economic Warfare, United States Commercial Company, United Kingdom Commercial Corporation, Eastern Group Supply Council, West African Produce Control Board, and West African Supply Centre), there are two types of combined Anglo-American agencies, functional and regional, which have added greatly to the experience of both governments in the control of industrial and economic activities. Examples of the combined functional agencies are the Combined Shipping Adjustment Board, the Combined Munitions Assignment Boards, the Combined Raw Materials Board, the Combined Food Board, and the Combined Production and Resources Board. Examples of combined regional agencies are the Middle East Supply Centre, and the Anglo-American Caribbean Commission. It is perhaps not looking too far to see in such organizations a prototype of the machinery which may be used after the war by the combined governments of the United Nations to supervise the activities of individual industries, such as non-ferrous metals, in the interests of consumers and to deal with the level of output and prices referred to in the foregoing, leaving the technical control of production and distribution in the hands of international association of the companies concerned.

Expansionism Essential—International combinations of all sorts have in most cases had a restrictionist outlook. They have been formed to maintain prices and to protect the interests of producers in times of falling consumption. It is true that sales development work has in many cases later been tacked on to their functions often with a good deal of skepticism on the part of die-hard members. Nevertheless, it is interesting to see how sales development work right down to the finished product has been initiated mainly by the raw material producers in the metal industries, even if supported by leading fabricators. This is certainly true of the Copper Development Association, the International Tin Research and Development Council, and the Zinc Development Association in Great Britain. In the future an expansionist outlook must accompany any international control schemes. British pioneers built railways in South America and developed river steamers in China in the last century because expanding trade benefited Britain in general and the merchant banking interests which financed the railways and steamers in particular. If China requires electrification after the war, not only must no consideration be allowed to stand in the way of its attainment, but the sales development branch of the international organization of the copper industry must play a leading part in stimulating this development, probably through and in conjunction with the international functional and regional agencies concerned. Government agencies are not at their best in stimulating new development, and the drive as well as the technical knowledge required are two of the most important contributions which can be made by industry.

International Currency—Such a conception leads to a consideration of the future of international trade, which is outside the scope of this review. Obviously the electrification of China and its influence on the copper industry is closely connected with tungsten and tung oil. One of the changes which may be visualized after the war is the establishment of an international currency.

SUMMARY

To sum up, the following postwar trend of developments in the non-ferrous metal industries must be contemplated if the Atlantic Charter is to become a reality:

(a) elimination of big fluctuations in price;

(b) prices to be related to cost of production;

(c) industry to consider "social costs" as an integral part of production costs;

(d) redundancy schemes to be provided for;*

(e) some degree of compulsion in order to enable a majority decision to be enforced—but with reservations;

(f) growth of international government economic agencies to supervise the activities of international organizations in the interests of consumers;

(g) expansionist, not restrictionist, outlook;

(h) international currency.

* The system hitherto commonly employed of fixing standard tonnages and a maximum percentage of these standard tonnages at which each mine may produce may have to be superseded by a system in which the higher-cost producers are closed down and the lower-cost producers supply whatever tonnage is required for consumption.

New York State's Iron Ores Draw New Attention

Adirondacks have been chief source of past recorded production . . . Other areas also have promise for future

▶ OPPORTUNITIES *for development of the mineral industry in New York are dealt with in a study made by the State Division of Commerce at Albany. Credit for the information brought together is largely given to the Office of the State Geologist. Chief among the mineral raw materials covered are iron ore and titanium ore. A résumé of that part of the report which deals with them is presented.*

NEW YORK has had an iron-ore industry for more than two centuries. In recent decades production has ranged between only 1 and 2 percent of the country's total. Beginning in 1938, a revival has been under way. Several of the large iron and steel corporations have entered the State and appear to have made plans for operation over an extended period. Mining of the titaniferous magnetites of the Adirondacks was revived after 1940.

Iron mining in New York has been comparatively stationary for more than 60 years. Production for the period 1869 to 1939 inclusive totaled 9,474,444 tons, the average for each of the last four years being 537,454 tons. Failure of iron mining to advance has not been due to ore exhaustion but because the industry has not been able to compete with the Lake Superior district.

In New York, iron mining has been and is largely underground. Much of the Lake Superior ore has come from economically operated open-pit mines. The larger underground mines there also have produced ore more efficiently than the New York mines.

New York ore generally moved via all-rail from mines to iron and steel centers. After the disappearance of nearby furnaces, ore had to be moved for considerable distances and incurred heavy freight charges. Lake Superior ore moves over short rail hauls and by Lake vessels to Lower Lake ports.

The New York ores have had a spotty market along the eastern seaboard because of foreign competition and because the eastern merchant pig-iron furnaces have been eliminated.

At present New York has a substantial iron and steel industry in the Buffalo district. This area, however, owes its success to the economical tapping of Lake Superior ore, Western Pennsylvania and West Virginia coke and coal, and nearby limestone.

The Iron Ores and Iron-Ore-Mining Regions

New York has deposits of all commercially important iron ores, namely: magnetite, Fe_3O_4; hematite, Fe_2O_3; limonite, $2Fe_2O_3.3H_2O$; and siderite, $FeCO_3$. The magnetite deposits are the most important. Reserves of hematite are substantial. Limonite is not at present mined. The small deposits of siderite do not appear to be of commercial value. Any of these ores may vary widely in quality and value.

In the following, the iron-ore mining industry is examined by regions and by types of iron ores.

Nontitaniferous Magnetites of the Adirondacks — Since record-keeping began, about 1880, the nontitaniferous magnetites have yielded most of the iron ore produced. In the past decade production has come mainly from two to four mines situated in the areas of Mineville-Port Henry, in Essex County, and Lyon Mountain, in Clinton County.

Traces of titanium occur in almost all Adirondack magnetites. The nontitaniferous ores also include those which carry a small proportion of titanium, usually less than 1 percent. Such ores present no problems to smooth blast furnace operation. The deposits are underground, irregular in shape and size, and frequently extend to great depths. One estimate of the State's nontitaniferous magnetites places the reserves at 900,000,000 tons running 40 to 60 percent iron.

1. In the Mineville-Port Henry mineralized area, the period of most active mining, not including the present, was from 1905 to 1920. This area has been the most productive. There is no sign of exhaustion. The orebodies must be ranked among the world's great magnetite deposits.

The operating set-up has undergone important changes. In 1937 Republic Steel Corp. leased mines and 100,000 acres of ore-bearing lands from Witherbee Sherman & Co. Since 1938 the following changes have taken place: First, the blast furnaces at Port Henry have been dismantled. Second, in 1941, an additional mine was developed with help from the Defense Plant Corp. Third, during 1941 the Corporation erected at its own cost a modern wet-process magnetic concentrator of an annual capacity of 700,000 tons of concentrates. Fourth, the old sintering plant was modernized and expanded. Sintering concentrates are shipped to Cleveland, Buffalo and Troy.

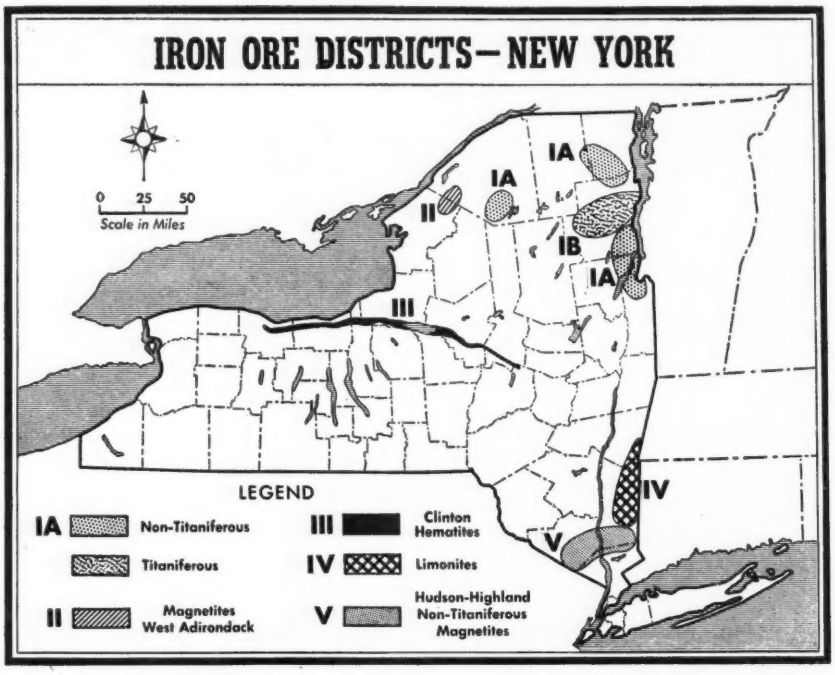
2. In the Lyon Mountain area the main orebodies lie within a narrow northeast-southwest belt along the southeast edge of the valley floor of Upper Chateaugay Lake. Production since 1880 has been continuous. The area has been the second most important producer in the Adirondacks and has been noted for its high-grade concentrates, the annual output, however, averaging much below that of the Mineville region. Reserves are large.

On Aug. 1, 1939, Republic Steel took over the mineral properties of Chateaugay Ore & Iron Co. The latter's furnace at Standish, with a rated annual capacity of 100,000 tons of pig iron, was dismantled. Mining and concentration capacity has been expanded, and late in 1942 operations were on a large scale.

3. The (a) Benson, (b) Clifton, (c) Jayville, and (d) Fine deposits in the south-central part of St. Lawrence County were discovered long ago. Then, their utility was not seriously considered because of inaccessibility. The Jayville deposits were worked from 1880 to 1890. The Fine deposits have not been worked apparently.

The Clifton deposits have not been worked in recent decades. In 1941 the M. A. Hanna Co. acquired them. Late in 1942 mining was in progress.

The Benson deposits were first worked extensively in 1889, since which time mining has been intermittent. Magnetic attractions suggest the reserves are large. A high-grade concentrate can be made. In



IRON ORE REGIONS having the major occurrences in New York State are shown. The several mineralized areas are indicated by the symbols that are given in the legend

July, 1941, Jones & Laughlin Steel Corp. leased 3,200 acres of mineral lands from Benson Iron Co. It carried through a $5,000,000 construction program, including provision of mining and transport facilities and erection of a concentrator with an annual capacity of 800,000 tons of concentrated and sintered ore.

4. Ausable Forks area comprises the hills north of the Ausable River between Ausable Forks and Clintonville. The various bodies constitute one of the largest occurrences in the Adirondacks. A high-grade concentrate can be made. The area is comparatively accessible.

5. The Hammondville area centers around Hammondville 15 miles south of the Mineville area. Exploratory work has established that reserves of suitable ore are substantial. The deposits are irregular and occur in many bodies. Mining would seem to present no more difficult technical problems than at Mineville.

6. In the Saranac Valley area, in Clinton County, a band of ore deposits extends for 6 or 7 miles from Redford southwest and then west to beyond Clayburg along the Saranac River valley. The bulk of the ore remains in place and the tonnage seems to be large. It ranges from 35 to 45 percent in iron. The orebodies are thin in places. A good concentrate can be made.

7. The Fort Ann deposit, in Washington County, includes several orebodies on Putnam Mountain north to Fort Ann village. Reserves are unknown. The ore is 40 to 45 percent in iron; some of it is high in sulphur.

The Salisbury deposit in Herkimer County is 5 miles north of Dolgeville. The orebodies, seemingly no more than a few feet thick, will probably remain undeveloped.

This revival of interest in Adirondack ore rests on sound foundations. The war has speeded the development. Bases for revived interest are: First, some of the principal steel corporations have depleted their reserves of direct-smelting iron ore in the Lake Superior district. In the search for additional reserves the Adirondacks would naturally attract attention, as these ores can compete with Lake ores that need beneficiation. Second, higher taxes are always threatened in the Lake Superior district. Third, with improved techniques, magnetites can be concentrated and sintered at low unit cost. Fourth, the sintered concentrates constitute an exceptional blast-furnace raw material.

The Titaniferous Magnetites of the Adirondacks—These titaniferous magnetites are essentially aggregates of magnetite and ilmenite, and carry at least 8 percent of TiO_2, as ilmenite, the average being perhaps 15 percent. They have attracted intermittent attention over a century, mainly because of the immense size of the orebodies and their rather high magnetite content. Interest has centered on their possible value as iron-ore resources. During the past few years the deposits have come into the limelight again, because of increased demand for titanium.

In the Lake Sanford area are the largest deposits of titaniferous magnetites. Accessible reserves are thought to be well over 100,000,000 tons. The deposits outcrop on both sides of the narrow valley occupied by Sanford and Henderson lakes. The largest orebody lies between Lake Sanford and Sanford Hill. Other important bodies lie between Cheney Pond and Lake Sanford, and east of Lake Henderson between the lake and Mt. Adams. Outcrops are extensive, with great masses of ore near surface.

In recent months the Lake Sanford area has come under large-scale development, the immediate cause being the war. Curtailment of imports of titanium ores induced the National Lead Co. to examine domestic titanium deposits. Early in 1941 it took title to 11,000 acres of mineralized lands in the Lake Sanford area. The Krebs Pigment and Chemical Division of DuPont has since joined National Lead. A limited portion of this land is being developed intensively.

The enterprise[1] has done 11,000 ft. of diamond drilling and blocked out 15,000,000 tons of ore running 16 percent TiO_2. Open-pit mines have been laid out, and a crushing plant and concentrators have been built to produce an ilmenite concentrate and a by-product magnetite concentrate containing about 10 percent TiO_2.

Titaniferous orebodies outside of the Lake Sanford area appear comparatively small. The mineralized area, designated as Little Pond and Tunnel Mountain, is important enough to warrant separate attention. Little Pond is 2 miles south of Elizabethtown, and Tunnel Mountain is east of Little Pond. These orebodies are of some size.

Information about the other orebodies listed is meager, but they seem to be small. The Moose Mountain deposit is on the shoulder of Moose Mountain east of the summit. The Split Rock deposit is marked by mine openings in the cliff of Split Rock Mountain facing Lake Champlain, midway between Westport and Essex. Deposits are listed for Lincoln Pond, 5 miles northwest of Mineville, and at Port Leyden, Lewis County.

Hematites of St. Lawrence and Jefferson Counties—The hematite orebodies occur in belts extending from Antwerp and Theresa, Jefferson County, northeast through Rossie, Macomb, Gouverneur, Fowler, Edwards, Hermon, DeKalb, and Canton, in St. Lawrence County. The main mines that once operated were confined to a limited area running from Antwerp northeast to near Gouverneur. Since 1910 little mining has been done.

[1] This enterprise is described in *E.&M.J.*, Dec. 1942, by I. D. Hagar, pp. 41–49.

The individual orebodies are scattered, irregular, and vary considerably in the character of the ore over short distances. The iron content ranges from 40 to 55 percent for the richest. Some of the orebodies are high in phosphorus and silica.

These hematite occurrences have been studied the least of any of the major areas in the State. Available information suggests that establishment of large-scale mining would be uneconomic. During 1942 active mining was under way on a small scale by the Rossie Iron Ore Co. in Rossie Township, St. Lawrence County.

Hematites of the Clinton Formation, West-Central New York.—Hematites of west-central New York have been mined intermittently for over a century. Output in 1937 was 139,000 tons. In recent years most of the production has gone into mineral pigment.

These ores extend from Otsego County westward to Rochester, Monroe County. They occur either in a single bed or in two seams. Where measured, the beds are a few inches to 6 ft. thick. On the north side of the east-west belt the beds are close to surface, with outcrops at many points. The dip is south. Taken as a whole the mode of occurrence is simple and uniform. The iron ranges from 35 to 45 percent. The ore is self-fluxing.

Reserves, including only those parts of the beds 18 in. or more thick, not more than 500 ft. below the surface, and with an iron content of 40 percent or better, are placed at 600,000,000 tons. The most desirable sections appear to be near (1) Clinton, Oneida County, (2) Brewerton, Oswego County, (3) Sterling Station, Cayuga County, and (4) Williamson and Ontario, Wayne County.

These hematites have not been able to compete with Lake ores. Strip mining is uneconomic because of the high ratio of overburden to ore. Moreover, the ore belt coincides with areas of high surface productivity, which strip mining would destroy. Also, strip mining would make the landscape unsightly in an area now attractive.

In recent years mining in Oneida County has been underground. Due to the thinness of the beds, the development cost per ton is high.

Included with these hematites of west-central New York are deposits near Clinton carrying 60 to 70 percent Fe_2O_3. In other localities analyses indicate an Fe_2O_3 content below 60 percent.

The war economy has greatly increased the demand for mineral pigments. Last summer mining was active in two places. The Clinton Metallic Paint Co. worked in Kirkland Township, Oneida County, and the Fruitland Iron Ore Co. in Ontario Township, Wayne County.

Limonites of Dutchess and Columbia Counties—An iron industry, based on the limonite iron ores of Dutchess and Columbia counties, was set up about 1750. From 1850 to 1900 an iron industry was based on them. Blast furnaces built then and earlier have disappeared. The orebodies are scattered, many are small, and the ore is often embedded in waste. The most important areas extend (1) from the Hudson Highlands across the townships of Fishkill, East Fishkill, Beekman, and Unionvale and (2) in the north-south valley from Hillvale, Columbia County, south to the Hudson Highlands.

Magnetites of the Hudson Highlands—Magnetite deposits of southeast New York in Orange and Putnam counties were once the basis for an important industry. No mine has been worked since 1931, when the Forest of Dean, 5 miles west of Fort Montgomery, was closed. The worked orebodies of the region have yielded a total of 6,000,000 tons of furnace ore.

Deposits are distributed along well-defined southwest-northeast belts. These indicate favorable conditions for mineralization. In Orange County the zone of favorable ore occurrence extends from the Hudson River near West Point southwest into New Jersey. Two belts are situated in the western part of Putnam County and one belt is in the southeast. Finally, there are isolated orebodies.

Orebodies of the Hudson Highlands are irregular in shape, warped, and corrugated, and some have shoots which are divided or partly divided by country rock. Surface exposures give no clue to underground form.

The ores mined were the richer magnetites carrying 50 to 60 percent iron, which occurred in irregular masses 10 to 25 ft. thick, but of undetermined extent. As far as known, the bottoms of the abandoned mines are in ore like that found in the parts of the deposits worked. Nevertheless, the main supply for the future seems to consist of ore which is somewhat leaner than mined in the past, but which can be concentrated magnetically. No quantitative estimate of the remaining rich ores, and the unexploited leaner ores, has been made. However, in the past decade some exploration and diamond drilling have been done by steel companies. A summary of the ore belts follows:

1. Sterling-Scott group: Twenty-two mines and prospect pits on several subsidiary belts of magnetite have been described for this restricted area, which extends from the northern ends of Sterling and Tuxedo lakes to the south and southeast across the New York-New Jersey line. In 1920 the Ramapo Ore Co. held all of the mines by lease and operated some of them.

2. Warwick group: Several mines were situated on the subsidiary belt of magnetite which lies along the summit of Warwick Mountain, south of Warwick. Considerable ore remains, but it carries 2 to 3 percent sulphur.

3. Forest of Dean group: This belt, in east-central Orange County, is named after the Forest of Dean mine, 5 miles west of Fort Montgomery. Much of the belt was added to the West Point Military Reservation in the past decade.

4. O'Neil and Forshee mines: These were based on an isolated deposit 3 miles south of Monroe. No mining has been done since 1880. The ore carries 40 percent iron. Reserves are unknown.

5. Phillips belt: The magnetite bodies are thin, though remarkably continuous and regular, especially toward the northern end, where several mines once operated. Save one, these never attained depth.

6. Sprout Brook belt: This lies along the western margin of Sprout Brook Valley. Considerable ore remains. Sulphur range is from 1 to 2 percent.

7. Brewster belt: This band of magnetite extends from Brewster southwesterly for 5 miles. Analyses indicate 43 to 60 percent iron. Sulphur is too high for use without beneficiation. None of the mines went to great depths. Substantial reserves are thought to remain.

8. The Tilly Foster mine: Located on an isolated orebody near Brewster, this was a large producer from 1864 to 1897. Reserves are unknown.

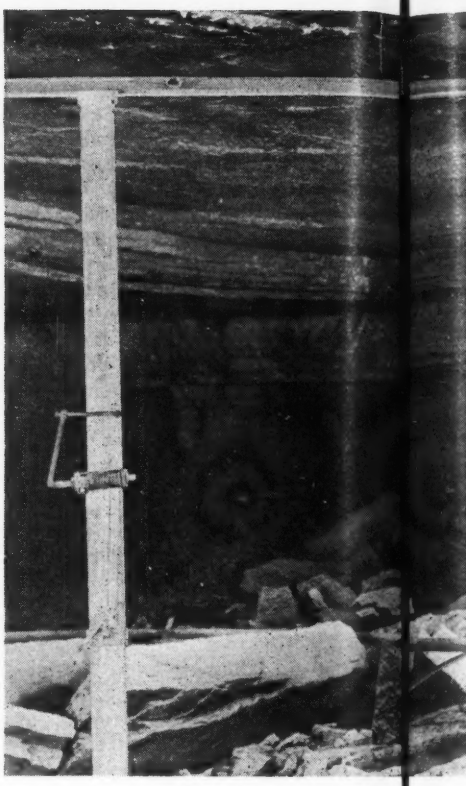
9. The Mahopac mine: The isolated orebody lies northwest of Kirk Lake. Active mining took place from 1880 to 1895. The ore, though irregular, is of good quality. Analyses indicate 50 to 60 percent iron, with low sulphur and phosphorus. It is claimed that the ore is largely self-fluxing. Further exploration is justified.

Although the Hudson Highland magnetites are conveniently situated as to market, there are certain deficiencies of the orebodies: Evidence indicates they are much smaller than the well-known deposits of the Adirondacks. An orebody may be of large extent running parallel with the structure of the country rock, but is likely to be of limited thickness. In some orebodies the iron varies greatly over short distances. High sulphur eliminates others. Despite these limitations, several orebodies look favorable enough to justify further examination.

CHANNEL IRONS for Roof Control

St. Joseph Lead finds them effective at the Leadwood Mine

W. W. Weigel
St. Joseph Lead Co.
Leadwood, Mo.



AN IMPACT WRENCH supported by a light block and tackle is being used to tighten up a nut against the channel iron. The loose end of the latter is temporarily supported by a homemade extension column. Photo by U. S. Bureau of Mines

IN RECENT YEARS, roof control has come to be an important problem in the Southeast Missouri lead district where the St. Joseph Lead Co. mines are situated. With the demand for greater production, areas formerly passed up as having bad back are now being worked. Low-grade orebodies are being mined where the ore must not be diluted by barren roof rock and both the high-grade and the low-grade areas must be made safe and convenient to work.

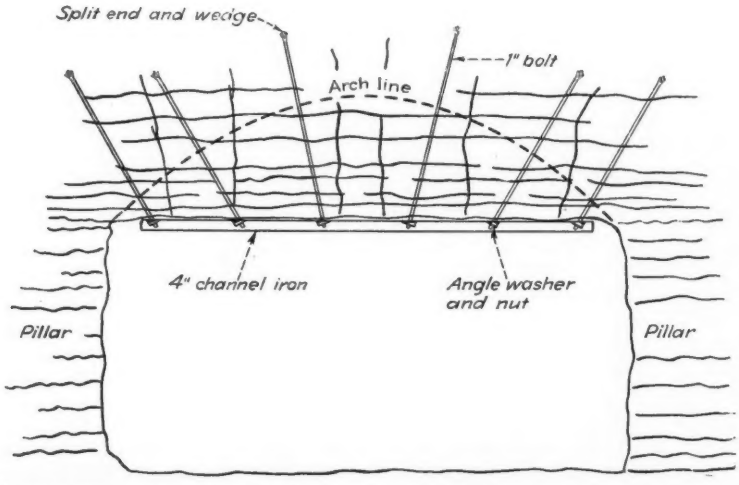
The district as a whole extends over several counties, but mining is largely concentrated in a 50-square-mile area in St. Francois County, with a smaller area in Madison County. There are several types of ore occurrence in the district, but only one, the so-called disseminated galena, is mined by the St. Joseph Lead Co. In this type, occurring in the Bonne Terre dolomite, more or less disseminated grains of galena make up horizontal blankets of ore. The ore is not uniform, as there is much horizontal banding and many minute veinlets of galena occur along joints and fractures.

Mining is done entirely by open breast stoping. Pillars are spaced from 20 to 50 ft. apart and the stopes vary in height from 7 ft. to more than 200 ft. Horizontal size varies from narrow runs 20 ft. wide to large areas 2,500 ft. wide. The width of the orebodies has very little to do with the roof condition. Some of the worst back is over narrow runs. Average grade of ore mined at present is about 3 percent lead, but there is much variation from place to place.

Bonne Terre dolomite is approximately 375 ft. thick. The upper 250 ft. is a light tan to gray, almost pure dolomite occurring in very thick and strong layers. It is in this part that the famous high open stopes up to 240 ft. in height are located. Normally the back in this part of the formation is excellent. Spans of over 100 ft. have held for 50 years or more, with little evidence of spalling.

Overlying the Bonne Terre dolomite is the Davis shale. There is very little ore, however, in the top 50 ft. of the dolomite, and the shale has no influence on the mining. The bottom 125 ft. of the Bonne Terre becomes progressively more thin-bedded, with much glauconite and many shaly layers and partings. In some parts of the district this is very pronounced. The formation gradually merges into the underlying LaMotte sandstone.

Orebodies in this transition zone between the Bonne Terre and the LaMotte have presented a back problem for some years. This was formerly solved for low-ground hand-loading stopes by the use of timber posts, usually with wide caps. Pillar spacing



CHANNEL IRON and long bolts are employed to support loose back below the natural arch line in a heading, seen here in cross-section

could be cut to 15 ft. or less. The advent of mechanical loading by full revolving shovels such as the Thew or St. Joe, which for effective use require a swinging radius of 12 ft., brought the problem up again. Clear spans of 24 to 25 ft. with no obstructions would be required.

Making the back in the form of a flat arch from pillar to pillar was satisfactory where the rock layers were not too thin. This, however, either tied up ore near the pillars or caused dilution from the barren rock above the ore. The projecting brows around the pillars were a distinct safety hazard. In many cases, particularly at the Leadwood mine, the rock was in layers only an inch or so thick. The glauconite and shale partings between the layers caused the loss of most of the natural cohesion of one layer to the next, and each thin layer had to act as a separate beam. Much vertical jointing was present, and as the layers would tend to air-slake, arching became useless. In some places, arching to a vertical height of more than the span failed to produce even a semi-stable condition. The back would be found loose even ahead of the breast.

It had been the practice for years to strengthen the back in certain places with bolts, wedged several feet up in the back, with a plate a few inches square at the bottom. Two of these a few feet apart with one long plate between them gave much more support than two separate bolts. Many of these pins pulled out in heavy ground, however, and others allowed the back to stope itself around the plates.

In 1936 and 1937, a new system was developed at the Leadwood mine which has given full satisfaction. It consists of supporting the ground below the natural arch line and anchoring it to the solid rock above and especially to the rock above the pillars. This is done before the rock actually comes loose. As the self-stoping condition of the back is usually a progressive action, if the lower layers are caught and held tight the upper ones do not cause trouble. The succession of thin layers thus becomes one thick, heavy beam of sufficient strength to carry from pillar to pillar.

Use is made of 4-in. structural-steel channel irons, weighing 6.25 lb. per foot. These are long enough to reach from pillar to pillar. Holes are cut in the web of the channel large enough to pass a drill bit and about 4 ft. apart. Bolts 1 in. in diameter from 6 to 10 ft. long are put through these holes up into the roof, and the back of the channel iron is securely bolted up against the roof. Spacing and arrangement of the channels varies according to conditions. In average bad ground, the channels are placed 5 to 10 ft. apart. In exceptionally bad ground, it may be necessary to cut down the spacing and even to run a second set of irons at right angles to the first.

In putting up the irons, the first hole is drilled at an angle of 60 deg. sloping away from the loose ground, if possible into the back over a pillar or to where the back is evidently solid. This is drilled to the depth desired (6 to 10 ft.) and a 1-in. bolt of a length to project only a few inches out of the hole is inserted. The bolts have a split end and wedge for the upper end. The other end has a standard machine thread for 6 in. Use is made of a special drill-steel dolly about a foot long with a rounded shank and with an attached female threaded head about 3 in. long to fit the thread of the bolt. This is screwed on the bolt to the base of the head to avoid thread damage while driving the bolt tight. The dolly is then inserted in a jackhammer and the bolt driven home. The rounded shank avoids the necessity of having special non-rotating machines for the purpose. Two minutes with the jackhammer drives the split end of the bolt completely around the wedge. Much of the success of the method depends upon this tight pin. If pins set in this manner are put in a testing machine, the 1-in. pin will pull in two before the wedge will let loose. Pins driven by hand with a sledgehammer may pull out from the wedge.

After removal of the dolly, the channel iron is placed over the pin. As the sloping hole is not square with the iron, a heavy angle washer is used to give a square shoulder for a nut. The nut is run up as tight as possible by means of an air-driven impact wrench. The tightness of all the bolts and of the channel iron against the back is the important part of the method. There must be no play for the back to start to loosen up or to allow slippage between the layers.

In a similar manner the other bolts are placed. The end bolts always lean away from the middle of the iron. The others may be put up vertically or leaning, either in the vertical plane of the channel iron or to the side. The two end ones are usually put up first in actual practice. Then the iron gives support while the rest of the bolts are being placed. A small hole is usually burned in the side of the channel near the bolt holes. This allows a small block and tackle to be hooked on the iron for supporting both the jackhammer to drill the holes and drive the bolts and the impact wrench.

Stoper drills are not employed in the district, and as the usual height of the stope in these bad-ground areas is about 12 to 15 ft., the use of the block and tackle avoids much of the heavy lifting. Some drill men prefer to mark the holes and to drill them all first before putting up the iron. Still others may work from one end of the iron to the other, temporarily supporting the loose end. In ground 12 to

15 ft. high, two men can put in a six-hole channel iron in a shift. Two wooden horses and planks make a working platform, or a portable scaffold may be used for stopes up to 20 ft. high. In higher ground, it is necessary to run hanging scaffolds (See *E.&M.J.*, August, 1932, or Peele's "Mining Engineers' Handbook" 3d. Edit. page 10-134) and to install the irons from these, advancing the scaffold along the length of the channel iron. If the condition of the back is doubtful, the irons are put in before the bluff is shot out, and the scaffold is not necessary.

The method is flexible and many modifications in spacing and length of channels and in the length and direction of the pins are used. The pins from one iron are often directed to end above the adjoining irons and thus gain mutual support. In areas of very bad back, it is advisable to place an iron as soon as there is space along the breast. As the faces of the headings are rounded, these irons may be only from 5 to 10 ft. long. Later, with advance of the heading, longer irons are put between the short ones.

Small faults, major slips, and water channels encountered in the workings have always been a cause of bad back. A few irons at right angles to these strengthen them enough to relieve the trouble. The light irons are flexible enough to adjust themselves to irregularities in the back. A small amount of wedging may be necessary on very rough back.

A recent development has been the use of the irons to strengthen pillars. In certain areas of intense jointing, air-slaking soon made the pillars practically nothing but piles of rock. Some of these have been treated by bending several channel irons around them more or less horizontally and then bolting them to the pillar in the same manner as for the back but with bolts only about 4 to 6 ft. long.

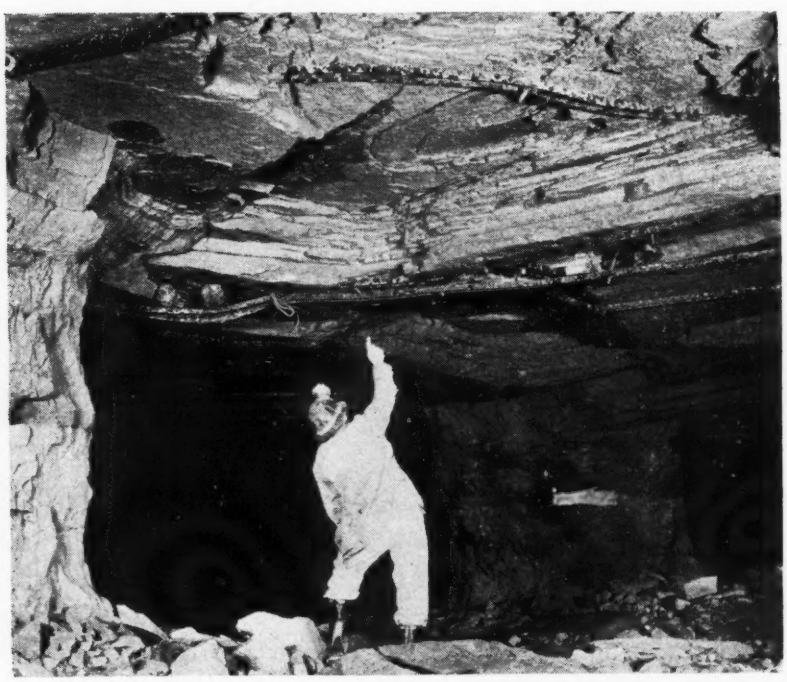
Upon completion of a stope, part of the channel irons can be recovered by removing the nuts from the bolts and retreating away from the face of the stope. As the work of installing them and the bolts are the chief items in the expense, however, this has not been common practice. The cost of the irons can be considered as insurance against wanting to use the stope later.

Failure of the back after it has been supported with channel iron has been very rare. In nearly all the cases, it has been due to failure to follow the set procedure, such as not using the impact wrench to tighten the nuts. When properly tightened up, the bolts should give a good sound ring upon being struck. In the two or three cases of actual failure, there have been contributing geological causes, such as isolation of a block by open joints or flat mud channels above the top of the bolts.

The main advantages of the method in Southeast Missouri are the ease and flexibility of installation, the safety of the men working under the reinforced back, the lack of interference with shoveling equipment or scraper rope lines, and the avoidance of any necessity of protecting the irons from nearby blasting.

Acknowledgments are due the officials of the St. Joseph Lead Co. for permission to publish this material. The picture on pp. 70-71 is shown with the permission of the U. S. Bureau of Mines. The others are from files of St. Joseph Lead's safety department.

TESTING THE TIGHTNESS of channel iron and bolts in an old stope with medium back. The irons have been in for several years



BADLY BROKEN BACK with open spaces as wide as 1 in. between the layers is visible here. This back has held up for four years

Grinding North Carolina MICA

Both wet and dry processes are used

WET GRINDING is practiced at English Mica Co.'s No. 1 plant, here seen on the bank of the North Toe River in the Spruce Pine region, North Carolina

MICA FOR GRINDING is derived from either scrap or schist. By scrap is meant the waste from plants fabricating sheet mica or the byproduct mica obtained[1] in working pegmatite deposits that cannot be sold as sheet mica. The grinding may be either dry or wet. Here we deal more or less briefly with the operations of two companies, the English Mica Co., with plants in Mitchell County, western North Carolina, and the Southern Mica Co., which mines in this area but grinds its product at a plant in northeastern Tennessee. The information given was obtained in the field.

The English Mica Co. formerly mined for white mica but no longer does so, having found that it can buy this material more cheaply. Buying is done from numerous sources, the principal supplier being the Bradley Mining Co., Franklin, N. C. English company mines biotite, however.

Its mica-grinding plants are four in number—all in the Spruce Pine region. They are:

Plant No. 1, which handles white mica only. Three grades of mica are made, each in various meshes. Its output is sold to the plastic, paint, and rubber trades.

Plant No. 2, a biotite plant, producing only one grade—namely, water-ground biotite mica for the rubber industry and for dusting molds. English Mica Co. has the only biotite mine or mines in the district.

Plant No. 3 is equipped with the Micronizer for producing very fine sizes. Its output is used in the paint and textile industries. It produces three grades of mica, each in two meshes. These are:

"A" mica, white—1,000 mesh and 3,000 mesh.

"B" mica, not so white—1,000 mesh and 3,000 mesh.

Biotite, gray—1,000 mesh and 3,000 mesh.

Plant No. 4, purchased in September, 1941, was formerly operated by the Diamond Mica Co. It was a dry-grinding unit which produced mica for roofing but now is producing water-ground mica similar to that turned out by plant No. 1.

Normally the company sells its mica all over the world. It also has a tourmaline byproduct and a vermiculite byproduct for which markets are yet to be developed.

No. 1 plant is operated by water power on water taken from the North Toe River. During the past year a new 56-in. Standard Simpson turbine, manufactured by James Leffel & Co., Springfield, Ohio, was installed. It works under a 12-ft. head. In this area, a dry season occurs approximately every three years.

Mica pulverized to about 8 mesh is received at No. 1 plant in burlap bags which are unloaded on the floor above the grinding mills. There are five of these mills. The mill used is of the chaser type, having four wooden rollers running on a wooden bottom built up of 8-in. lengths of 4x4-in. pine standing on end. The grinding must be done on wood in order not to kill the luster or sheen of the mica. Both steel and concrete have been used but have proved failures. The wood, moreover, must not stain the mica. Black gum can be used. The rollers are 40 in. in diameter and have a 26-in. face and are driven in the mill at 16 to 18 revolutions of the central shaft per minute.

Grinding here is a batch process. To charge a mill requires approximately 1½ tons of mica. This is put in dry and then dampened enough so that the roller will stay on top and not sink. Normally all the mills are charged at the same time. The mica is ground 8 hours and the mills are then discharged all at the same time into a settling vat. Sand containing mica that settles out is returned and ground until all the mica is released. This may be done as often as three times, depending on the grade of material.

The settling vat is of wood and about 8 ft. wide, 20 ft. long and 2½ ft. deep. After it is full, the charge is allowed to settle 36 hr. and the water is siphoned off. The mica is then shoveled into cars and delivered to a slip tank under the floor from which it is pumped (by a Patterson pump) to a Patterson filter press.

The cakes from the press are dropped into a car, which is run on to an elevator, then raised to a floor having four Bartlett Snow steam-jacketed kettle dryers, each 10 ft. in diameter and 3 ft. deep. Inside, a single plow having a length equal to the inside diameter revolves at 12 to 15 r.p.m., almost touching the bottom. Three hours are required for drying a batch of 1,000 to 1,200 lb. to the point where the mica can be screened.

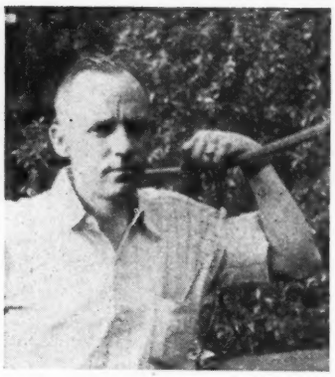
The mica is now elevated to a scalping screen (Barnard Leas Mfg. Co., Moline, Ill.) to remove trash; then to six inclosed Sprout-Waldron (Muncy, Pa.) screens. These six screens are in three groups of two each alongside of each other, the two screens in each group being one over the other, as shown in the sketch on page 74, and covered with cloth of the stated mesh.

Material to be screened passes through these screens in the order of the numbers. Oversize from each screen goes to the next in order. Undersize from each is ready for packing. Oversize from No. 6 is taken off for regrinding.

Screened products go to two Sprout-Waldron packing machines. For paint

[1] This definition is given in Public Health Bulletin No. 250, U. S. Public Health Service, Washington, D. C., p. 14.

C. S. GUNTER, of Spruce Pine, vice president of the English Mica Company



R. H. GUNTER, in charge of operations at English Mica Co.'s plants in Spruce Pine region

14XXX silk 325 mesh (1)	(3) 14XXX silk 325 mesh	(5) 12XXX silk 160 mesh
14XXX silk 325 mesh (2)	(4) 12XXX silk 160 mesh	(6) 12XXX silk 160 mesh

FINAL SCREENING in English Mica Co.'s No. 1 plant is done on six enclosed Sprout-Waldron's screens, arranged in groups of two, one over the other, as above

mica, the undersize from the three 14 XXX reels is taken. For rubber mica the undersize from all six reels is taken. For one type of wallpaper, one grade takes three 12 XXX and combines them. For another grade of wallpaper, No. 1 may be left out and two 14 XXX and three 12 XXX may be taken.

At the No. 2, or biotite, plant the procedure is the same, save that the drying is accomplished somewhat differently. It is done on pipe steam tables, filter cake being laid on, dried, and taken off. Steam power is used.

The No. 3, or Micronizer, plant is small. The equipment includes a 100-hp. boiler, which is fired with coal by an automatic stoker to make 100 lb. steam used in the Micronizer; a Foster-Wheeler Superheater No. 8, heating to 550 deg. F.; two Micronizer units; an elevator, a bin, and a series of three sifters made by Ty-Sa-Man Mfg. Co., Knoxville, Tenn.

English Mica Co. is the only one licensed to use the Micronizer for pulverizing mica. Under its license the company can grind anything that is 51 percent or better in mica. Each unit will pulverize to 3,000 mesh and will produce 4 to 5 tons at 1,000 mesh in 24 hr., or 3 tons at 3,000 mesh in 24 hr. One man per shift is required.

Crude mica received in bags is fed into the Micronizer hopper, a bag at a time. This machine consists of a shallow circular grinding chamber wherein a circulating charge of mica is acted upon by numerous steam jets, issuing through orifices spaced around the periphery of the chamber and so directed as to keep the mica rotating at high speed. The high-pressure steam cuts across the flow of mica, setting up intense interactions which reduce the mica in size but maintain its flake-like particle shape. The steam is withdrawn at the center of the grinding chamber and the mica is classified by this same centrifugal action. As soon as the particles reach the desired size, they gravitate toward the center and drop below to the collector, where the material is bagged. The degree of pulverization is controlled by varying the steam pressure, the flow of the mica, or both.

Screening at plant No. 3 is conducted in the same manner as described for plant No. 1. However, many of the products are so fine that screening is unnecessary.

Plant No. 4, formerly a dry-grinding plant, has been converted to wet grinding. It is operated by water power in about the same manner as is No. 1 plant, save that the wheel is smaller and the power developed is less. Possession of the plant will prove especially advantageous when the river is low, compensating for the decreased amount of power developed at No. 1 plant.

Hamilton Douglas, of Atlanta, is president of the English Mica Co.; J. B. Preston, Jr., of New York, is executive vice-president, C. S. Gunter, of Spruce Pine, is vice president, and R. H. Gunter is in charge of operations.

Operation of Southern Mica Co.

Southern Mica Co., of which D. D. Rice, of Johnson City, Tenn., is owner, mines and washes mica in the Spruce Pine region and brings it to its plant in Tennessee for grinding.

The mine is an extensive open cut, very narrow in places, where a schist has been mined for ten years. The plants are close to the road, but the mine workings extend about 1,000 ft. back, winding with rather steep walls. At the far end two men were employed on each of three shifts in hand mining—i. e., breaking the schist with a pick, putting in a shot where necessary, and allowing the broken-up rotten schist to fall into a sluice, about 6x8 in. in cross-section, in which a strong flow of water is maintained which carries it down through the cut on a 7-percent grade to the upper of two plants. A new level has recently been opened up in this cut by falling back to the entrance and dropping down 25 ft. vertically.

Treatment in the plants is shown in the accompanying flowsheet. Plant capacity is ¾ ton per hour.

Mica produced in the washing and screening plant is dried, sacked, and shipped to the Tennessee grinding plant. The latter plant is on the site of the old Cranberry furnace, which ran on iron ore from Cranberry, N. C., 75 years ago and more recently, having also operated during the first World War. The building, a three-story brick structure, was built 50 years ago. There is an adjacent warehouse covered with corrugated iron sheeting.

The mica is brought from North Carolina in 100-lb. burlap bags in box cars. Trucks are used at times when crude mica is needed. On arrival at the grinding plant the bags are hand-trucked to the warehouse.

To feed the mica into the plant the bags are withdrawn as necessary and dumped one at a time into a small hopper delivering to a belt conveyor approximately 100 ft. long and inclined about 30 deg. This runs up through the warehouse, and, passing through the wall, dumps within the brick building into a chute that can be made to deliver to any one of three bins, each capable of holding 50 100-lb. bags, or 2½ tons. These bins are circular, 3 ft. in diameter by 15 ft. long, and of riveted sheets.

Each bin tapers off at the bottom in a conical (truncated) end that delivers directly into the top of a Raymond Improved Automatic No. 0 pulverizer for screen separation. The fineness of grinding in each pulverizer is controlled by the circular stationary

screen in it, through which the material must pass before it can get out. In two of them a perforated screen with $\frac{1}{8}$-in. round hole was being used at the time of the visit; in the other a woven-wire screen of approximately $\frac{1}{4}$-in. mesh. Finer mesh is not used, inasmuch as the mills get warm. This method of grinding destroys the sheen. (In the Spruce Pine area there are wet-grinding plants. Wet grinding preserves the sheen.)

When the mica is ground fine enough in the Raymond pulverizer it escapes from the mill into a 4-in. galvanized pipe which delivers to an 8-in. galvanized pipe which is under suction produced by a fan in the basement. This pipe delivers to a cyclone on top of the building. This feeds through a split (two-way) chute to two sets of two (one over the other) Day Ro-Ball sifters, made by J. H. Day Co., Cincinnati. The screens in each set will vary according to the product wanted. At the time of visit the upper sifter had 20 mesh on top and 40 mesh under it. The plus-20 and plus-40 sizes go to a Bauer Bros. (Springfield, Ohio) plate mill. The minus-40-mesh size goes into the bottom sifter, which has an 80-mesh screen. Both the plus-80 and the minus-80 mesh sizes are sacked for shipment.

The plate mill delivers by a separate suction pipe and fan to another cyclone on top of the building (of same size as the other), which delivers to a third set of two Ro-Ball sifters. The top sifter (at the time) had a 40-mesh screen above and a 60-mesh screen below. The plus-40 size goes to the plate mill and the plus-60 is finished. The −60-mesh size goes through to the 80-mesh screen and the +80 and −80 sizes are sacked.

The screens can be changed according to products desired. The products are:

Three roofing grades

No 40—through 20 mesh plus 40 mesh

No. 60—through 40 mesh plus 80 mesh

No. 160—through 80 mesh

Two plastic paint grades

No. 100—through 50 mesh

No. 250—through 100 mesh

Mica for insulating flakes through 6 mesh plus 16 mesh.

The plant output is sold in competition with other similar products.

Capacity depends on the fineness of mesh of the product. If the plant were crushing to 6 mesh, its capacity would be 30 tons or more (perhaps 40) per 24-hr. day. Capacity on −35 mesh is approximately 20 tons.

To operate the plant, four men, including a foreman, are required. The plant sometimes runs 24 hr. per day.

Material shipped is bagged in 100-lb. burlap bags, using the Monarch friction clutch packer, made by Sprout, Waldron & Co., Muncy, Pa. The burlap is lined with paper (in two cases) when holding the finer sizes such as 100 mesh. Paper bags are used for only one customer.

Power is provided by a Buckeye 4-cyl. 100-hp. diesel engine. This runs a lineshaft, from which the Raymond pulverizers and certain other equipment are driven. The Buckeye also runs a Lincoln Electric 13½-kva., 2,300-v. generator, having a Robbins & Meyers 8-kw. 18.2-amp. exciter. This generator supplies current for individual motors elsewhere in the plant.

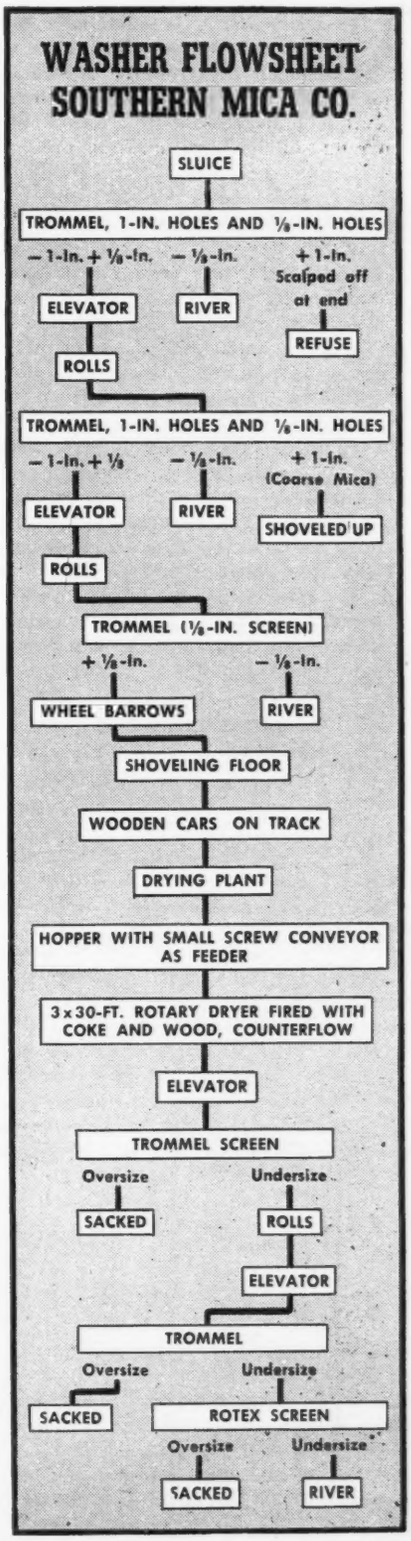
D. D. RICE, owner of Southern Mica Co., who makes his headquarters at his Tennessee plant

●

WET GRINDING and screening, followed by drying with further screening, constitute the treatment in Southern Mica Co.'s washing plant in North Carolina. The product is shipped to the Tennessee plant for final grinding

●

GROUND MICA is bagged in 100-lb. burlap sacks on this friction clutch packer. The bags are paper-lined



Positive Dual-Action Air Door Used in Resurrection Mine

Dwight L. Myers, *417 West 7th St., Leadville, Colo.*

UNDERGROUND MINES are often confronted with the problem of constructing a strong, substantial door, placed in a strategic location underground to control air currents, obviate fire hazards, prevent theft, and to comply with the usual laws of mine safety. The Resurrection mine, at Leadville, Colo., has met the problem with a positive-acting, heavy-duty steel door that is operated satisfactorily by compressed air many times a day.

The main haulage adit is the well-known Yak tunnel. It is over five miles long and connects with more than a score of deep shafts and about 80 miles of interlacing levels. The deep shafts all serve as chimneys and thus pull the surface air through the portal of the Yak tunnel. During the winter the velocity of this air reaches 2,000 f.p.m., air pressures of 5 to 6 in. of water are recorded, and temperatures as low as 30 deg. F. below zero are felt. The tunnel is laid with a single track of 52-lb. rail, over which must pass the constant traffic of ore, muck, and supply trains servicing the operations of the Resurrection mine and mill. The tunnel drains the mines of the district, and the resulting flow is confined to a deep drainage ditch parallel to the haulage track.

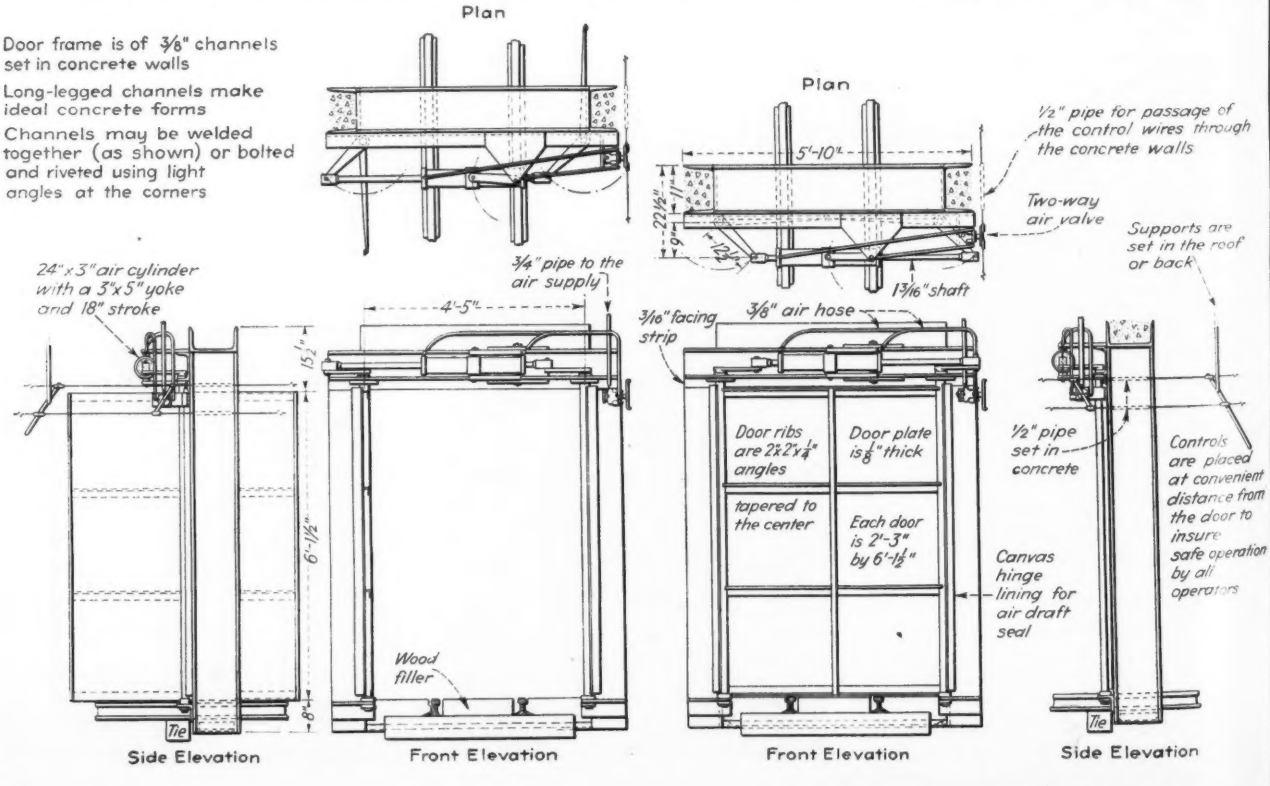
The problem was to install a door of positive action that would work effectively against the high-velocity air current, bypass the water flow in the drainage ditch, operate without difficulty in the very cold temperatures, and be operative from either side, and yet be simple enough for anyone to work. The door must be fireproof to protect the timbering in the tunnel and to comply with the local safety laws.

Master Mechanic Doyle, at the Resurrection, constructed an all-steel door, actuated by compressed air, using an idea of Fred Porter, of Wallace, Idaho. The door is of simple design and uses a minimum of parts. It is actuated by a single air cylinder having a positive two-way action that will operate with air pressures as low as 10 psi. It develops an opening and closing force equal to 268 ft.-lb. at 60-lb. inlet pressure. This force is sufficient to overcome tunnel velocity pressures of 15 in. of water. The door can be operated from distant control stations, thus permitting the trains to pass without first coming to a complete stop. Its normal position is closed, as the mine is sufficiently ventilated by other adits.

The train crews upon approaching merely swing a lever at a control station about 100 ft. from the door as the train passes the station. The intervening 100-ft. space between door and station allows ample time for the door to open so that the train may pass. After the train has passed completely through, the crews swing a lever at another remote-control station to close the door behind them. Controls are also placed at the door to accommodate pedestrians. One remote-control station is in the mine office, so that the complete control is maintained in case of emergency. The door will change position within five seconds. The drainage water is made to pass through a concrete, submerged air seal at one side and below the door.

As installed by the Resurrection company, the door has two swinging parts. Each is 74x27 in., and combined they open up a space 8 ft. 2 in. by 4 ft. 6 in. Either larger or smaller installations can be made, using the same principle of construction. Each

OF SIMPLE DESIGN and with few moving parts the door works effectively against the pressure of the rapidly moving air in the Yak Tunnel. At the left, below, the door is seen open, in elevation. At the right, it is seen closed


Plan
Door frame is of 3/8" channels set in concrete walls
Long-legged channels make ideal concrete forms
Channels may be welded together (as shown) or bolted and riveted using light angles at the corners
Plan
1/2" pipe for passage of the control wires through the concrete walls
5'-10"
Two-way air valve
Supports are set in the roof or back
13/16" shaft
24"x3" air cylinder with a 3"x5" yoke and 18" stroke
3/4" pipe to the air supply
4'-5"
3/16" facing strip
3/8" air hose
15½"
6'-1½"
8"
Door ribs are 2"x2"x1/4" angles
Door plate is 1/8" thick
tapered to the center
Each door is 2'-3" by 6'-1½"
Canvas hinge lining for air draft seal
1/2" pipe set in concrete
Controls are placed at convenient distance from the door to insure safe operation by all operators
Wood filler
Tie
Tie
Side Elevation
Front Elevation
Front Elevation
Side Elevation

door hinge is a 2-in. shaft about 8½ ft. long. The doors are welded to their respective hinges, each hinge running the entire distance from the top to the bottom of the door frame. A 14-in. lever is welded to the top of the hinge and is connected to the shaft, which passes entirely through the 3-in. air cylinder. Thus the double doors are activated by compressed air operating within this 3-in. cylinder against a piston head fastened to the driving shaft. The cylinder is fastened to the upper part of the door frame by two links which permit it to swing in coincidence with the driving shaft that is connected to each of the door levers. The frame of the door is built of steel channels which border concrete walls. The concrete was poured after the steel frame had been placed to insure complete sealing. Channels were used because they make ideal concrete forms over which the usual wooden forms can be used.

The linkage by which the air cylinder is connected to the door frame is the factor responsible for the positive and dual action of the doors. It has also enabled the designers to eliminate the need of many compensating parts, and to utilize but one air cylinder to function for the entire assembly.

Steel wire controls are connected to an inexpensive four-way air valve that permits the passage of compressed air into either end of the air cylinder to actuate the doors. The steel wire is strung in tandem for several hundred feet each way from the door. Control handles are tied in series to the steel wire at convenient locations from the door. A solenoid attachment is installed to permit the door to be operated from remote points (such as the outside office), in an emergency. The electric eye is another electrical accessory that could be applied to the control of the door if conditions should warrant automatic operation. At the Resurrection manual control has been found satisfactory.

Because of the simplicity of design and the few but integrated moving parts, the maintenance of the door amounts to an occasional inspection and lubrication. The door uses a minimum amount of compressed air and has no noticeable effect upon the other consumers of compressed air in the mine.

This is a paper submitted in the contest sponsored by the Compressed Air Institute.

Tunnel Employees Not Affected by Exhaust Gases

CONSIDERATION of the use of diesel-engine-driven locomotives for underground haulage has always involved the question of permissible concentrations of carbon monoxide or other toxic gases found in exhaust vapors of internal-combustion engines. A recent publication of the U. S. Public Health Service takes up this point in discussing the observed effects, or lack of them, of carbon monoxide on the general health of a group of traffic officers continually exposed to the gas.

The pamphlet, Public Health Bulletin No. 278, is called, "A Medical Study of Men Exposed to Measured Amounts of Carbon Monoxide in the Holland Tunnel for 13 Years." The men referred to are 156 traffic control officers who have been more or less continuously on duty in the tunnel connecting New York and New Jersey since it was constructed. Traffic in the tunnel is exclusively automobile. Because the CO content of the tunnel's air has always been accurately measured and recorded, the state of health of these officers should furnish an accurate indication of the effect on humans of at least the concentrations of CO found in the tunnel.

Average CO content of the air regularly breathed by these men was 70 parts per million. This represents a numerical average rather than a stable condition, because wide traffic variations in the tunnel caused constant fluctuation in the amount of CO present. At the entrances and in the down-grade parts of the tunnel, only 20 p.p.m. of CO might be present, but in the up-grade sections, particularly during periods of heavy traffic, 200 p.p.m. or more were encountered. Tunnel air is sampled and analyzed automatically and continuously, and if the CO content passes 250 p.p.m., an alarm bell is rung and an auxiliary ventilating system cuts in until the excess CO is removed.

To equalize exposure to CO, each officer's 8-hr. shift was divided into four 2-hr. periods, two of which were spent in the tunnel proper, and two in the entrance plazas. A measurable quantity of CO was always encountered in the entrances, so that the officers, though not always exposed to the high concentrations of the tunnel interior, never while on duty breathed air entirely free of CO. The average value of 70 p.p.m. for their exposure takes this factor of change of location into consideration.

To aid in studying the results of exposure to CO, tests have been devised which permit measurement of the percentage of the hemoglobin in the blood which has combined with CO. Sayers and Yant, in Public Health Reports 38:2053-2074, 1923, describe the effect of varying degrees of exposure to CO as follows: Persons with less than 10 percent of their hemoglobin combined with CO feel no particular discomfort; between 10 and 20 percent combined hemoglobin results in slight headaches; severe headaches, weakness, dizziness, dimness of vision, and nausea were experienced when 30 to 40 percent was combined with CO. The highest value measured in testing the Holland tunnel traffic officers was 15.2 percent, and the lowest, 0.5 percent. None of the men complained of any particular chronic symptoms, but all said they suffered headaches during periods of heavy traffic in hot summer weather, which is not surprising nor altogether attributable to carbon monoxide.

Thorough physical examination of these officers failed to show any heart disorders or neurological failures to a degree which might not also be found in any similar group of men not exposed to CO. In fact, because the men were better-than-average physical specimens when appointed to their positions, their present condition is also better than average. Without detailing the many exhaustive tests made on these men, it can be said that no evidence was found of any permanent or temporary ill effect of their exposure to the carbon monoxide concentrations met in the tunnel.

These results must, of course, be applied with some caution to mining conditions, which differ in a number of respects from those in the Holland tunnel. For example, diesel engine exhaust gas may prove more toxic than that of gasoline engines. The maximum permissible concentration of CO in mine air has been set at 100 p.p.m., but S. H. Ash and L. L. Naus in Bureau of Mines I. C. 7222, Oct. 1942, point out that if the CO in that concentration came from diesel engine exhausts, the accompanying oxides of nitrogen would probably reach 235 p.p.m., a concentration vastly more toxic than that of the CO. They suggest that 10 p.p.m. of CO would more nearly represent a safe condition as far as diesel engines are concerned. Although average exposure in the Holland tunnel was 70 p.p.m. and maximum, 235 p.p.m., it is evident that the nature of the exhaust gases must also be considered in applying these figures to mine operation.

Mine, Shop, and Plant

Lubrication and Compressors

EVERYONE admits the importance of lubrication and nearly everyone gives it some attention. It is the occasional chap who doesn't who is most likely to burn the bearings up. And even "some" attention may not be enough. Hence reminders and the need for careful supervision. Note the following on compressors:

The first rule, according to the Compressed Air Institute, is to use oil according to specifications which the maker may prescribe, and then deal with a reputable oil company that will guarantee a lubricant of maintained specification satisfactory for the service.

A reciprocating compressor may need three different types of oil—one for the cylinders, one for the driving-gear bearings, and a third for the power cylinders, provided the power source is steam, or oil or gas engine.

For the single-acting trunk piston machine the oil must be suitable for both the cylinders and running gear, and of the kind known as compressor cylinder oil, with specifications suitable to the particular machine. Double-acting piston-type compressors, in which the frame running parts and the cylinders are completely separated, require cylinder oil for the cylinders and crankcase or bearing oil for the running gear.

Compressors vary so widely as to type and use that it is impossible to prescribe one oil specification that would be completely suitable for all conditions. The following for compressor cylinder oils is taken from the Institute's Trade Standards which would apply generally to most air compressor installations. These are:

Flash point, 350 deg. F., minimum.
Viscosity S.S.U. at 100 deg. F., 245 minimum.
Viscosity S.S.U. at 210 deg. F., 45 minimum.
Pour point, plus 35 deg. F., maximum.
Neutralization number, 0.10 maximum.
Conradson carbon residue, 2.0 percent maximum.

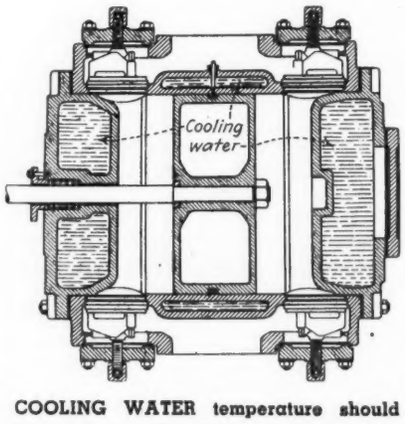
Special requirements call for special treatment. If the cooling water is of a much lower temperature than the incoming air, condensation is formed on the cylinder walls, with resulting poor lubrication. The answer may be to heat up the cooling water to more nearly the temperature of the intake air. The ratio of the initial and final pressures developed in cylinders has an important bearing on the oil selected, as this in great measure determines the maximum temperature prevailing in the cylinder. Size and speed of the compressor also have considerable influence on the discharge temperature of a cylinder.

Minimum Allowable Rate of Feed of Oil in Compressor Cylinders—Ideal Conditions

Cylinder Diameter, In.	Piston Displacement per Cylinder, cf. m.	Swept Surface per Cylinder, Square Feet per Minute	Oil Feed Per Cylinder	
			Drop per Minute	(*) Pints per 10 Hours
Up to 6	Up to 65	Up to 500	2 d. in 3 m.	0.05
6 to 8	65 to 125	500 to 750	1	0.075
8 to 10	125 to 225	750 to 1,100	4 d. in 3 m.	0.10
10 to 12	225 to 350	1,100 to 1,500	1–2	0.112
12 to 15	350 to 600	1,500 to 2,000	2–3	0.188
15 to 18	600 to 1,000	2,000 to 2,600	3–4	0.262
18 to 24	1,000 to 1,800	2,600 to 3,600	4–5	0.338
24 to 30	1,800 to 3,000	3,600 to 4,800	5–6	0.412
30 to 36	3,000 to 4,500	4,800 to 6,000	6–8	0.525
36 to 42	4,500 to 6,500	6,000 to 7,500	8-10	0.675
42 to 48	6,500 to 9,000	7,500 to 9,000	10–12	0.825

* Figures in last column are based upon 8,000 drops per pint at 75 deg. F.

The amount of oil required in a compressor cylinder will vary with the type of machine, its speed, and local conditions of operation. It is well to use it liberally while the machine is new and until the cylinders have been glazed. The quantity of oil should then be gradually reduced, using care to examine the cylinders occasionally by taking out a valve to see if the walls are amply coated. Do not overlubricate, as an excessive amount of oil in the discharge is undesirable and to be avoided. The accompanying table gives the minimum allowable rate of feed under ideal conditions. Use of this table should be amplified by frequent examinations of the walls.



COOLING WATER temperature should be as close to that of the air in the compressor as possible, to minimize condensation on the cylinder walls

Steam cylinder oil may vary appreciably, depending on steam temperature. For moderate steam temperatures, the following specification is submitted from the Trade Standards.

Flash point, 500 deg. F., minimum.
Viscosity S.S.U. at 210 deg. F. Seldom less than 100.
Pour point, 80 deg. F., maximum.
Conradson carbon residue left on evaporation, 4.5 maximum.
Compounding, 0 to 12 percent maximum.

Entirely different considerations are required for the lubrication of both rotary compressors and centrifugal compressors and exhausters. Most of the different types of rotary compressors and vacuum pumps employ different lubricating specifications. Follow manufacturer's instructions carefully.

Centrifugal compressors and exhausters require bearing lubrication only, and in overhung units that have no bearings of their own, only the driving mechanism is lubricated. Ball or roller type anti-friction bearings on small pedestal or multi-stage units require grease or oil in the usual manner. Larger and higher speed units generally have pressure lubricated sleeve bearings. Here again the manufacturer should be asked what he advises.

Air Lines and Accessories

MUCH MANPOWER is wasted by improperly installed and maintained compressed air systems, the Compressed Air Institute also contends. An efficient compressor cannot give full service unless the auxiliaries, such as piping, aftercooler, and receiver, are properly designed and installed.

Starting at the intake, it is important that the air be drawn from as cool and clean a place as possible. Weight of air handled by a compressor varies

inversely as the absolute temperature of the intake. If, therefore, the intake temperature can be reduced from 80 to 60 deg. F., the compressor will have about 3¾ percent more capacity. If dust or foreign matter is continually sucked in, it causes rapid wear of working parts.

Efficient intake filters should be installed on the compressor intake, and the operating log should call for cleaning them at stated periods. The intake air should come from outside of the building where it can be had as cool as possible. It is often beneficial to have the intake near the roof, if the air is better there, or on the north side rather than the hot side, if convenient. The intake pipe should be turned upward so that the air is taken from at least 10 ft. above the ground, to avoid sucking grit from the ground level, and should be protected from the weather so that rain cannot get in.

Intake piping should be short and direct, with long-radius elbows where necessary. If it is not over 12 ft. long, the intake diameter should equal the diameter of the compressor cylinder opening: if the pipe is longer, its diameter should be increased to the next size larger.

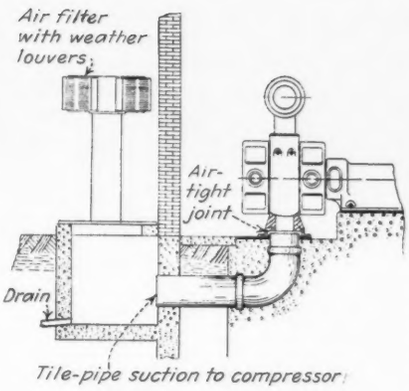
Necessity for thoroughly cleaning suction lines cannot be over-emphasized. Welding shot, scale, or other foreign matter when pulled into a compressor frequently causes serious damage to the cylinder. If a large cemented tunnel is used for the suction line, its surface should be carefully glazed and treated to insure against cement dust being sucked in with the air.

Above ground, the pipe should be of standard steel or spiral-riveted; below ground, it may be of glazed vitrified clay with all joints carefully cemented to make them water-tight.

Discharge lines should be of ample size, for if too small, there is excessive pressure drop. Larger diameters are desirable where the lines are long. Sharp bends and elbows also increase the friction loss and should be as few as possible.

Air discharged by the compressor contains moisture, which is deposited as the air is cooled while traveling through the lines. The presence of water in the lines may give rise to leaks at joints or the water may freeze in the pipes in exposed places. The major danger, however, occurs where the air is used in pneumatic tools and the water, by washing off the lubrication, causes them to wear rapidly and interferes with normal operation.

Aftercoolers are installed to remove as much of the moisture as possible at the compressor before the air enters the main air lines. Obviously, however, the amount that can be thus removed depends largely upon the cooling water



THE INTAKE PIPE should be turned upward so that the air is taken from a point at least 10 ft. above ground

temperature. Therefore, the circulating water for the aftercooler should be as cool as possible. It is also obvious that, if the air in the lines is cooled by room temperature to below the temperature of the air at the aftercooler outlet, some additional moisture will be precipitated in the air lines, although the amount will be small.

The aftercooler should be as near the compressor as possible, with a receiver of liberal size directly beyond. The receiver is helpful in taking care of instantaneous peaks but is used primarily to eliminate pulsations in air lines and permit a steady and mean velocity through them. As a result, the air line beyond the receiver may be smaller than that between receiver and compressor, which latter should never be choked down. Receivers should also be provided in the various places where the air is used, if these are distant from the compressor, to give a constant supply of reasonably dry air.

All receivers have drain cocks near the bottom, which must be drained daily, or, if no aftercoolers are used, the receiver should be drained several times per day on damp humid days when moisture is a maximum. Safety valves on receivers should be tested occasionally by lifting the valve levers or raising the pressure to operate the valves, to insure their being in proper condition.

Obviously a shut-off valve should never be inserted in the line between compressor and receiver unless a safety valve is placed on the compressor side of the shut-off valve. Operators will forget to open the latter upon starting the compressor, causing serious damage to the machine. For the same reason, it is necessary to install a safety valve between the compressor and the first shut-off valve in the pipeline, if the compressor is connected into an air main with other compressors.

Leaks in the piping system are perhaps one of the most common and most easily corrected losses in a compressor plant. They are easily found, due to the noise of even a small stream of escaping air. The financial loss can assume considerable proportions. Leakage at 100-lb. pressure through a single ⅛-in. orifice would amount to roughly 6,000,000 cu.ft per month At 6c. per 1,000 cu.ft. this loss would cost $360 per month. Air lines, air hose, shut-off valves, and other connections should be tested when the plant is not in operation, by packing the lines and shutting down the compressor to see how rapidly the pressure drops.

Ways of testing for leakage include holding a candle flame close to the joint to see whether the flame will flutter; or soapy water may be swabbed around the joints, and, if there is a leak, it will produce a soap bubble.

All hose connections should be made from the top of the distribution lines, so that the hose will not pick up moisture lying in the bottom. The line should be blown out well before it is connected to a pneumatic tool. On most air lines, high-pressure hose couplings are required. To maintain the hose in proper condition, it should be turned end for end occasionally. All kinks should be avoided, but, when they do occur, should be carefully untwisted. The hose should be kept on racks when not in use.

Maintaining the Vertical Turbine Pump

► *This discussion of the vertical turbine pump, prepared for E.&M.J. by I. Alvin Oliver, consulting engineer for Joshua Hendy's Pomona Pump Division, is concluded in this issue. The pump motor and the thrust bearing were discussed in the April number.*

THE MOTOR HEAD—Short-coupled, multi-stage turbine pumps are designed for high-pressure heads. When they start up, the impellers and drive shaft tend to rise, because their weight is relatively small compared to the lifting action on the impellers. After the discharge head builds up, the impellers settle down to normal running position. To overcome this momentary rising, which may disconnect the driving pins on the safety clutch at the top of the motor assembly, a heavy setscrew thrust collar is attached to the head shaft just below the motor. Allow about ⅛ in. running clearance from the central hub of the lower housing after the impellers have been adjusted. Some designs of motor heads have a non-reverse ratchet built into the upper part of the assembly. These ratchet pins should be dry—avoid use of oil

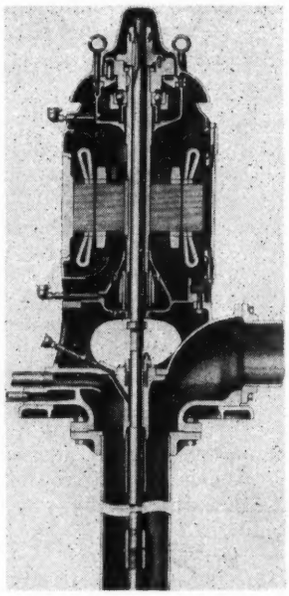
and grease. They must rise and drop freely, and it is beneficial to have a slight oiliness on the ratchet teeth.

ALIGNMENT—Many cases of pump vibration, noise, and even driveshaft breakage can be traced to misalignment of the motor pump head. For close-coupled, short-setting, or sump pumps where the turbine pump unit hangs freely in the sump, the pump head may be mounted level, so that the entire unit will hang vertically. For long-coupled pumps or on deep settings or bore holes where the pump and discharge column may be inclined at a slight angle, the pump head must never be leveled. It must be supported at the same angle as the suspended parts. The axis of the motor drive unit must be in perfect alignment with that of the drive shaft in the discharge column. By shimming up under the head base plate, the drive assembly may be tilted as required until the head shaft centers in the upper end of the clearance bore through the hollow rotor shaft. Some cases of head vibration can be traced to a poorly balanced motor unit. This can be checked by removing the drive hub from the shaft at the upper end and running the motor by itself.

THE PACKING BOX—On turbine pump jobs there must always be a packing box somewhere on the unit. This may be hidden above the pump unit, where the leakage simply will bypass back into the well or sump, or on the head in plain sight and easily accessible so it can be kept in working condition. The simplest boxes are usually best. One of four or five rings compressed by a two- or three-bolt follower or packing gland will give best service. Periodic inspection will keep it in condition.

On high-pressure jobs the box should be checked and tightened at least once a day. A packing should never be squeezed down so tightly as to prevent all leakage. There should be a slight trickle always oozing from the packing to keep it lubricated and cooled. If the packing is too tight, with no leakage, it will burn and score the shaft and require excessive power. When the gland will not follow down further, it must be removed and another ring of packing added. Always stop the pump when the box is to be repacked. When packing becomes hardened and will not hold the pressure properly, it should be removed and new rings inserted. Always stagger the joints and make sure that the packing is pushed evenly to the bottom. Most pumps with open drive shafts have a metallic sleeve bearing just below the packing, which in general is lubricated through a pressure grease cup filled with waterproof grease. It also lubricates the packing. Ordinarily, the cup should be given a half turn for every 4 hr. of running.

THE COLUMN—Discharge column and flanges, if the flanges are once properly installed, need little attention. All flanges and couplings must be pulled up tight to prevent leakage. A slight leak at high pressures will eventually erode the gasket and in time the metal surfaces of the flanges and bolt holes. Bolted flanges must be pulled up evenly all around. When two or more men are tightening the bolts, the last round should be done by one man only, and he should pull from about the same angle in each case with the same wrench, so as to get a uniform strain on each bolt. Better yet is it to use a torque wrench.



DRIVE END and discharge head of a vertical turbine pump, supported by the discharge column

DRIVE SHAFT—This requires careful handling during installation. It must be straight and true and be kept so, if dangerous vibration and breakage are to be avoided. Excessive running clearance in the bearings often causes shaft vibration. In a metallic bearing a clearance of more than 0.01 in. begins to get dangerous and will increase rapidly. In a rubber or resilient bearing 0.005 in. to 0.015 in. is about the proper running clearance, which may even go to 0.02 in. without serious effect.

Drive shafts are usually coupled by long threaded couplings. In many cases the shaft threads are left hand. To "break" loose a shaft joint when dismantling, two proper size pipe wrenches should be used, one on the shaft just above the coupling and the other just below. They should be placed in line on the same side, one above the other, and by pushing one and pulling the other in a scissor action the shafts will be twisted with minimum distortion. If the coupling resists, it may be tapped lightly with a smart blow while applying strain. Remember that striking a shaft or coupling with a hammer has a swaging effect which will distort it; hence care should be exercised. When installing either old or new shafting, screw the shaft ends together by hand so they will meet in the middle of the coupling, then give them only enough strain with wrenches to make sure that they butt properly. Never "pull up" a shaft coupling too tightly, for resultant misalignment may cause serious vibration.

(To be concluded)

Hard-Boiled Hats and Goggles Need Care

MINE SAFETY appliances will last longer if given proper care. The MSA company has just issued some useful instructions which every user of such equipment will do well to consider.

As to the hat, cleanliness is easily effected by thoroughly scrubbing it with a brush in warm soap and water, rinsing thoroughly, and then immersing it in a disinfecting solution such as 2 percent lysol in water. The sweatband may be turned outward during cleaning and drying and afterward returned to its normal position—contact with the scalp will oil and soften it again.

Should the lining become worn beyond repair, it can be readily replaced. The old lining is unlaced and removed. A new one is then laced in, in accordance with a diagram and instructions that the company has prepared.

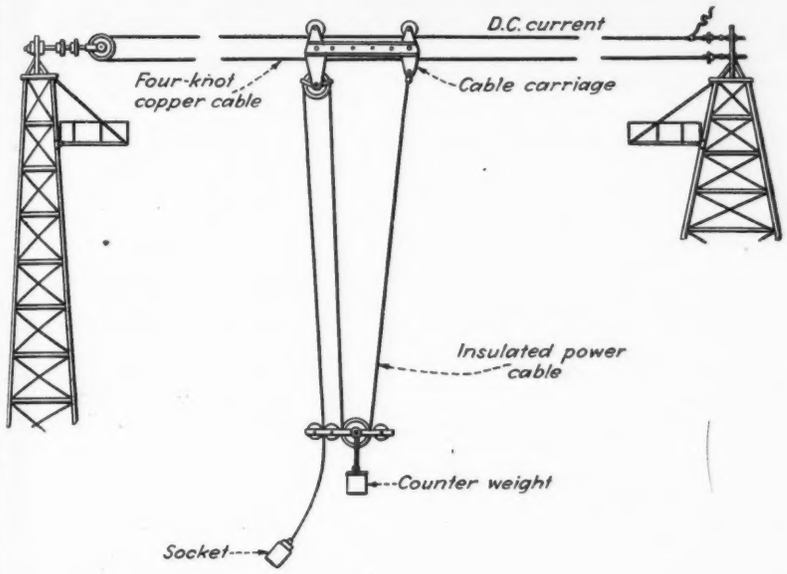
Goggles are comparatively inexpensive items in the safety equipment inventory, yet will return dividends in conservation if a few practical measures are maintained. These safety devices should be handled preferably through a central storeroom where proper maintenance can be effected, and issued to the workers at each shift.

Goggles should be cleaned regularly of accumulated dust and grime. The use of a soft bristle brush with warm water and soap is recommended.

In the small plant, sterilization by immersion of the goggles in mild lysol or formaldehyde solutions is easily arranged and will not harm most goggles. Alcohol, and many commercial disinfectants may also be used; the goggles should, however, be thoroughly rinsed and dried to remove any trace of the sterilizing agent. In larger plants, sterilization by a moist atmosphere of antiseptic gas is frequently used.

A major point in conserving goggles is insistence upon proper maintenance through inspection, repair, or replacement of minor parts. Regular inspection will detect bent frames, worn temple covering, and broken lenses.

Useful Operating Ideas



A Novel Power Cable Installation

PRIOR to the cable installation to be described, electric locomotives of Bunker Hill & Sullivan Mining & Concentrating Co., Kellogg, Idaho, handling slag-ladle trucks in or in the immediate vicinity of the blast furnace building obtained power from relatively low-hung trolley wires extending through separate openings in the building wall. Objectionable features of the layout were (1) danger of moving objects such as crane hooks and others becoming entangled with the wires, (2) obstruction of equipment both in place or moving, and (3) possible damage to trolley poles from moving or falling objects. These difficulties have been satisfactorily overcome by the power-cable installation explained in detail in the accompanying sketch.

As will be seen, the layout essentially consists of two steel towers erected at strategic points outside the blast-furnace building spanned by a carefully insulated length of four-knot copper cable as indicated, a simple cable carriage holding the insulated power-transmission wire passing through a series of sheaves, and a counterweight. All sheaves are fitted with heavy ball bearings and guide rolls and arms prevent the wire from slipping off the sheaves. Contact with the locomotive is made by means of a heavy socket at the end of the insulated power-transmission wire, and to insure maximum operating efficiency the cable carriage should run freely at all times. The item was kindly supplied by P. C. Feddersen, smelter superintendent.

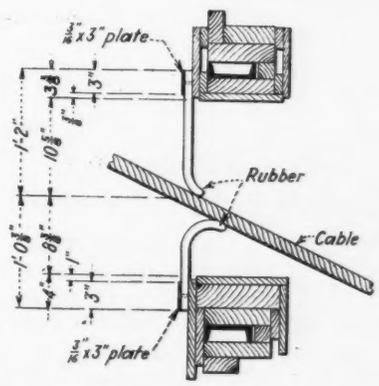
Hardening Concrete Floors to Prevent Dusting

TOP FINISHING of concrete floors does not always produce the hard, wear-resistant surface one has hoped to obtain. This is especially aggravating when the floor in point is near high-priced machinery which may be damaged by dust raised by traffic across the floor. Paul C. Ziemke, 2032 West Keefe Ave., Milwaukee, Wis., writes that his company was faced with such a problem in laying a floor in a building serving as a combination engine room, hoist house, and telephone central. It was planned to lay a tile floor over the dusty concrete eventually, but meanwhile a hardening mixture had to be prepared immediately.

An analysis of the top concrete showed a lack of cement. Working further, the company chemist developed a mixture of 3 lb. of zinc sulphate in 1 gal. of water, which was brushed over the concrete surface with an ordinary kalsomine brush. The floor's appearance and hardness were both greatly improved after the mixture had set for several hours, but the janitor who applied it complained of the acid odor of the substance and of its injurious effect on his hands. Accordingly, the chemist sought a substitute and found it in a mixture of 4 parts of water and 1 part powdered water glass. Brushed on in the same way, this mixture provided a surface that lasted for two years before dusting was again noticeable. In any further floor construction, however, more care is exercised in preparing the aggregate, and in addition 6 lb. of iron filings are applied to each square of floor surface before the final troweling.

Sealing Rope Openings on Hoist House

IN THE present war effort saving of fuels is quite as important as is conservation of materials and equipment. A considerable amount of oil, gas, coal, and wood is burned annually in heating plant buildings. Effective methods to bring about a substantial reduction in the consumption of heating materials include correct insulation of the buildings proper and sealing of necessary openings in roof and walls, especially at manufacturing plants, mines, mills, and smelters in regions with adverse climate. For instance, a 20-in. opening in a wall, as is the condition in some hoist houses, can admit a large amount of cold air, with consequent



increased fuel consumption. Owing to wear from contacting cables, satisfactory sealing of the rope opening in the wall of the hoist house always has presented some difficulties.

At the hoist house serving the Anselmo shaft of Anaconda Copper Mining Co., in Butte, Mont., rubber (a dependable substitute may serve in wartime) has been utilized to solve the problem mentioned, and the complete assembly is explained in the accom-

panying line drawings. Materials required are two rubber slabs and two ¼x3-in. steel plates. The rubber slabs shown are ½ in. thick, with two plies of duck on each side extending from the portion where the seal is fastened towards the center for a distance of 6 in., thereby stiffening that section of the rubber but allowing the center portion to travel inward and outward along with the movement of the rope. The seals for one rope are fastened on the outside of the building, and those for the other (lower) rope on the inside, the location in each case being where cable travel is closest to the center of the slot. Where a similar installation is planned, it is suggested that the design of the assembly be such that the four slabs (for two windows) be of the same dimensions, as maintenance is simpler and the price lower.

Cleaning Conveyor Belts

WHEN HANDLING soft, clayey mill feed, more or less fine material accumulates on the surface of the belt conveyor, and although a part of this accumulation is discharged with the ore, part remains on the belt and is distributed along the runways. The material thus deposited has to be removed periodically to prevent damage to the belt and pulleys. At a mill in South America the difficulty has been overcome by a scraper installation consisting of boards placed under the return belt near the discharge end for the purpose of cleaning the belt as much as possible. These consist of a ½-in. board 4 in. wide held in two supports and pressed against the return belt by springs inside each support or column. The weight of the belt causes it to scrape over the board, clearing itself.

Protecting Drive Pipe Threads in Placer Drilling

EXPERIENCE has shown that considerable lost time on placer drilling operations where drive pipe is used results from defective threads that break or hang up in the drive pipe couplings. According to John A. Roos, of Helena, Mont., whenever such trouble is experienced after driving a string of pipe which has been accurately threaded and in which the joints butt in the middle of the couplings, it is fairly evident that the damage to the threads was done in pulling the pipe. In that operation, all of the stresses transmitted through the knocking head are taken up by the threads; whereas in driving, most of the stresses are transmitted through the pipe butts rather than the threads. Examination of many defective threads under a magnifying glass verifies this conclusion.

Convinced that most of the abuse suffered by drive pipe threads resulted during pulling of the pipe, various materials were tried in an effort to find something that would, in effect, plate or build up unfatigued, worn, or loose threads to a point where the stresses would be distributed more or less equally to all of the threads. Cushioning rather than lubrication was sought, and a light gear lubricant, the Cardium Compound made by Shell Oil Co., was found most nearly to meet the requirements.

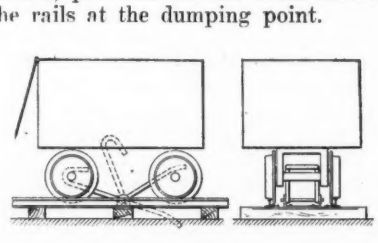
Warmed up and applied to dry threads, this material protected them to such an extent that crystallization of the pipe at the couplings would occur before the threads would fail. A single disadvantage is that the cementing action of this material is such that at times it is necessary to warm the couplings with a blow torch in order to break them. Time lost on this account proved a minor matter in view of the general results. Behavior of gold in subsequent panning of the drill samples was not found to be influenced by entry of the compound into the hole.

Five Dollars for an "Idea"

SHORTAGE OF EQUIPMENT in the present emergency puts a premium on the ingenuity of master mechanics and electricians to keeping mining and milling machinery running. If you have done an interesting job, just sketch or photograph it and send it in with a brief description. *E.&M.J.* will pay $5 for acceptable items.

Safety Catch Speeds Up Mine-Car Dumping

IN HAND TRAMMING with an ordinary-sized small mine car, considerable danger to either operator or car is encountered when the car is dumped over the end or side of the trestle or pocket. John Broatch, master mechanic of Bayonne Consolidated Mines, Ltd., Bayonne, B. C., describes a car stop which, properly made and installed, prevents the car from leaving the rails at the dumping point.

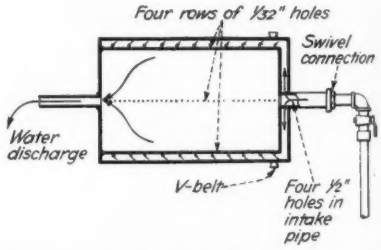


Shown in the accompanying drawing, the device was made of ⅝x1½-in. pick steel welded as shown to a bar of ½x3-in. steel which was attached by two lugs to the rails. If the stop must be moved frequently, one of the rail-gripping lugs is adjusted so that it can be hammered.

In operation, the front axle of the approaching car is engaged by the hooked part of the stop and the rear axle is held down by the curved portion. Because the axles are held at four points, the car is held rigidly for both forward and side dumping. When the car is pushed back, the front axle leaves the hooks and strikes the rear part of the stop, pushing it down again into the ready position.

Revolving Drum for Washing Detachable Bits

AT PROPERTIES where detachable drill bits are employed a job frequently performed is cleaning worn bits prior to actual reconditioning. In other words, oil, grease, and small rock particles must be removed from the bits



if a good job is to be done in the grinder, hot-miller, or forge. This can be done either by hand methods, which are slow and inefficient, or mechanically in some washing unit. It has given satisfactory service at the shop serving the Elton tunnel operations below the smelter of the International Smelting Co., at Tooele, Utah, and at the shops of Anaconda Copper Mining Co., at Butte, Mont.

The cut shows a cross-section of the revolving drum. As will be seen, the washer consists of a steel drum with welded-on trunnions and a door extending through the inner and outer walls of the drum for charging and removing bits, two bearings, and a simple frame made from old channel irons supporting the revolving drum and the small motor furnishing power through a V-belt drive. The inner shell of the drum is provided with four rows of 1/32-in. holes, which spray the bits in the drum when the washer is in operation. Water is introduced into the space between the outer and inner shell of the drum through a swivel connection at about 110 lb. Save for charging and removing bits after thorough washing, the device requires practically no supervision, and because of its simple design, maintenance costs are low.

A POSITION IS OPEN on the editorial staff of **ENGINEERING AND MINING JOURNAL.** Correspondence is invited from engineers, preferably with training and experience in metallurgy or ore dressing, or both, and with some facility in the use of the English language. Complete personal details, including salary level and selective service status, should be submitted with letter of application. Address the editor for further information.

Personal Items

F. Albert Morrison has removed from Reno, Nev., to Kingman, Ariz., where he will operate the Cerbat lead-zinc mine.

Robert A. Bryce was on April 12 re-elected president of the Canadian Institute of Mining and Metallurgy.

Harold G. Young, manager of Stadacona Rouyn Gold Mines, Ltd., Quebec, has joined the Royal Canadian Engineers.

K. C. Gray has been advanced from manager to general manager of Sylvanite Gold Mines, at Kirkland Lake, Ontario.

Capt. Arthur A. De Melik, mining engineer with offices in New York City, lately investigated strategic metal prospects in several Nevada districts.

Col. Frank M. Steel, formerly of Calgary, is now Dominion Inspector of Explosives and has offices at 305 Federal Building., Vancouver, B. C.

George Griffith has resigned from the field staff of Bralorne Mines, Ltd., and accepted a similar position with Sheep Creek Gold Mines, Ltd.

Rufus G. Little, of the Newalpitt Co., Deming, N. M., has been appointed a member of the Board of Regents of the New Mexican School of Mines.

William J. Loring, mine operator and consulting engineer, has been elected president of the San Francisco chapter of the Western Mining Council, formed recently.

Flying Officer J. R. A. Maconachie, formerly resident mining engineer at Nelson, B. C., was in Vancouver last month on forlough from the R.C.A.F. at Edmonton.

Frank Merryth is directing exploration and development work at the Black Prince tungsten property, near New Hazelton, B. C., on behalf of Privateer Mine, Ltd., optionee.

Harry O. King, director of the Copper Division of the WPB, has been appointed president of the American Arbitration Association, succeeding **Cornelius Vanderbilt Whitney,** now a colonel in the United States Army Air Force.

A. John Eveland, mining engineer of Reno, Nev., is with the U. S. Bureau of Mines and lately has been engaged in appraising the need for access roads to numbers of Nevada mines, principally in the northern part of the State.

R. E. Legg, formerly of the N. A. Timmins Corp., is now a flight lieutenant in the R.C.A.F. and is attached to the explosives division. He has returned to Canada after a period in England during the "blitz."

J. R. Van Fleet, vice president in charge of mine operations for the U. S. Vanadium Corp., has been inspecting mine properties of his company in Nevada, including two scheelite producers in Humboldt County, now worked by lessees.

M. Wallace Woolley, head of the ore-purchasing department of the U. S. Smelting, Refining & Mining Co., has returned to his Salt Lake City office after a tour of producing districts in Nevada.

Harry Hey has been elected president of Australasian Institute of Mining and Metallurgy for 1943. He is chief metallurgist of Electrolytic Zinc Co. of Australasia, Ltd.

Nathaniel Arbiter, former research assistant at Columbia University, has been appointed to the staff of Battelle Memorial Institute, Columbus, Ohio, and assigned to its division of mineral dressing and materials beneficiation research.

Philip B. Freeland, chief mining engineer of the British Columbia Department of Mines, was superannuated at the first of April, 1943. He has been succeeded by **Dr. Hartley Sargent,** formerly resident mining engineer at Vancouver.

P. C. Fedderson, since 1917 associated with Bunker Hill & Sullivan Mining & Concentration Co., latterly as general smelter superintendent, has assumed charge of a new slag-fuming unit now under construction as an extension of the lead blast furnace at Kellogg, Idaho.

H. B. Denis, field engineer of The Consolidated Mining & Smelting Co. of Canada, Ltd., has been transferred from the Yellowknife area, in the Northwest Territories, to that part of northern British Columbia and southern Yukon opened by the Alaska Highway.

Bertrand Robinson, formerly in the metallurgical branch of the Federal Department of Mines and Resources, visited Vancouver, B. C., last month in the course of a western business tour. He is now district manager of Hardinge Company, Inc., at Toronto.

C. M. Young, who has been in the department of mining and metallurgical engineering at the University of Kansas for many years, has been given leave of absence in order to participate in the war minerals program of the United States Bureau of Mines. He will be at Rolla, Mo.

Robert H. Raring, formerly managing engineer for the Copper Canyon Mining Co. south of Battle Mountain, Nev., now a captain in the engineering branch of the Army aviation service, has been visiting in Nevada, having been transferred from North Carolina to Hill Field, near Ogden, Utah.

John C. Roehm, who has been associate engineer in the Alaska Territorial Department of Mines for several years, has become associated with the Henry Kaiser enterprises. Before joining the Territorial Department of Mines he was engineer with the Chichagof Mining Co.

E. T. Stannard, president of the Kennecott Copper Corp., accompanied by **R. C. Klugeschied,** Kennecott secretary and treasurer, spent several days during April at the McGill, Nev., offices of the Nevada Consolidated Copper Corp., Nevada Kennecott division, in conference with **J. C. Kinnear,** manager.

Ralph V. Thurston, who had been directing a major-scale tailing treatment operation at Delamar, Idaho, prior to the shutdown of gold mines, has been appointed metallurgist at the Reno rare metals station of the U. S. Bureau of Mines and has taken quarters in the Nevada city.

Arch F. Boyd, formerly assistant general mine foreman for the Braden Copper Co., Rancagua, Chile, has been appointed mine superintendent at the Pine Creek tungsten unit, United States Vanadium Corp., Bishop, Calif. He succeeds **A. I. Rodriguez,** who becomes assistant plant superintendent at the same property.

Samuel H. Williston, of Portland, Ore., chief geologist for the Sun Oil Co. of Pennsylvania and vice-president of the Horse Heaven Mines, Inc., and Cordero Mining Co., notable producers of mercury in Oregon and Nevada, is in Mexico as a special BEW representative to appraise available mercury supplies there.

W. D. Haselton, of Duluth, Minn., recently resigned as vice chairman and a member of the executive committee of the Lake Superior Mining Section of the National Safety Council. His position as vice chairman will be filled by **E. A. Anundsen,** safety supervisor of iron mines for Pickands, Mather & Co., with headquarters in Duluth.

Cornelius F. Kelley, chairman of the board of Anaconda Copper Mining Co., in company with **James R. Hobbins,** president of Anaconda, in mid-April inspected the plant of the Basic Magnesium, Inc., near Boulder Dam, in southern Nevada, now producing metallic magnesium at one-half designed capacity and operated by Anaconda staff personnel.

R. S. Walker, consulting engineer for the M. A. Hanna Co., of Cleveland, is supervising construction of a 1,000-ton manganese leaching plant at the Three Kids mine, in Clark County, Nev., con-

struction of which has been financed by the Defense Plant Corp. and which will be operated by Manganese Ore Co., a Hanna subsidiary.

John R. Suman, president of the A.I.M.E. in 1941 and vice president of the Humble Oil & Refining Co. in charge of production, was on April 5 presented with the Lucas gold medal for 1942. Presentation was made at the Houston Club, at Houston, Tex., at a meeting of the Gulf Coast section of the A.I.M.E.

Arthur D. Whiteside, president of Dun & Bradstreet, has been named vice chairman in charge of civilian requirements. Mr. Whiteside has had extensive experience in government, both in the Office of Production Management and earlier in the National Recovery Administration. He succeeds **Joseph L. Weiner.**

Major Leverett Davis, engineer directing Idaho activities of the Callahan Zinc-Lead Co., flew lately by plane from his Boise office to inspect progress of work on scheelite claims in Pole Canyon, Nev., north of the productive Nevada-Massachusetts mines, where his work has been retarded by storms and snow-blocked roads.

A. E. Vandercook, now directing engineer for the Central Comstock Mines Corp., has occupied newly prepared living quarters and office at his company's "Middle Mines" group of old bonanzas on the Comstock lode, within the town limits of Virginia City, Nev., where his long-time millwright aide, **C. T. Wells,** is fighting the manpower problem in constructing an advanced-type cyanide mill.

Walter C. Page has resigned as deputy director of the Zinc Division of WPB. **Platt C. Benedict** succeeds him in that post. Mr. Page leaves WPB to join the staff of the United States Smelting, Refining & Mining Co. as assistant to **F. S. Mullock,** vice president and general manager at Salt Lake City. Mr. Benedict was formerly geologist with Newmont Mining Co.

Lieut. Col. J. E. Morrison, formerly in charge of the Grants Pass office of the Oregon State Department of Geology, was jointly responsible with **Ray C. Treasher** for the field work that resulted in the handbook of Josephine County metal mines in which 335 properties were listed. The news item in the December 1942 number of *E.&M.J.* inadvertently omitted acknowledgment of Mr. Morrison's participation in this work.

H. D. Budelman, general manager of the West End Consolidated Mines Corp., at Tonopah, Nev., has returned to Tonopah after serving Nye County as State Senator in the 1943 session of the Nevada State Legislature, at Carson City. The 60-day session was completed March 18, 1943. Mr. Budelman was appointed State Senator to fill the unexpired term of **Charles F. Wittenberg.**

Arthur D. Storke has resigned from the directorate of Selection Trust, and also as vice-chairman of Roan Antelope, Mufulira Copper, and Rhodesian Selection Trust. He has accepted an appointment as consulting engineer of Roan Antelope and Mufulira Copper. **R. L. Prain** succeeds Mr. Storke as managing director of Roan Antelope, Mufulira, and Rhodesian Selection Trust.

David Meredith has retired from the Electrolytic Zinc Co. of Australasia, Ltd., after 24 years' service as general superintendent at the works at Risdon, Tasmania. **W. C. Snow,** who has been on the staff of Electrolytic Zinc Co. of Australasia, Ltd., at the Risdon works, succeeds him.

H. H. Dunkin, senior lecturer in metallurgy at the University of Melbourne, has been appointed acting professor of metallurgy during the temporary absence of **Prof. Neill Greenwood,** who is engaged on work for the Department of Munitions. Mr. Dunkin previously held the positions of metallurgist to Triton Gold Mines, N. L., Western Australia, and to Mount Coolon Gold Mines, N. L., Queensland.

Paul J. Sirkegian, general suerintendent for Consolidated Coppermines Corp. at Kimberly, Nev., member of the Board of Regents of the University of Nevada, was the principal speaker at ceremonies at the Reno institution commemorating Mackay day, annual observance of recognition of benefactions accruing to the Mackay School of Mines, a department of the Nevada University that continues to provide the industry with some capable young engineers.

Cap. Donald Yates has been awarded the honor of C.M.G. Captain Yates served through the last war with the 1st. Tunneling Company of the A.I.F., and on his return joined the Broken Hill Proprietary Co., Ltd., in which he ultimately held the position of assistant to the acting general manager. In 1927 he became assistant general superintendent with Broken Hill Associated Smelters, Ltd., and for some years prior to resuming military duties, was general superintendent of the works at Port Pirie, South Australia.

Dr. Lloyd Montgomery Pidgeon, research chemist with the National Research Council since 1932, and who in 1937 was assigned to the development of a process for producing magnesium from Canadian ore, has been awarded the platinum medal of the International Nickel Co. The award was made under the auspices of the Canadian Institute of Mining and Metallurgy on April 12 at a one-day special meeting of the Institute, held at the Mount Royal Hotel, in Montreal, and was for "distinguished service to Canada and all the Allied Nations in perfecting a process for producing metallic magnesium." The Pidgeon process utilizes Canadian dolomite as a base material. Present facilities provide not alone for Canada's current requirements of magnesium but a surplus for the war needs of her allies. An article describing and illustrating magnesium production by Dr. Pigeon's method appears on pages 56 to 61 of this issue.

S. R. Micka, formerly supervisor of production at the Hull-Rust mine of the Oliver Iron Mining Co., in Hibbing, Minn., has been made a superintendent. **John Chisholm,** assistant superintendent of the Hull-Rust mine, has also been made a superintendent. **J. E. Machamer,** assistant superintendent of the Hartley-Fraser mine, in Chisholm, Minn., has been made superintendent of this property. **H. M. Pickering** has been promoted from assistant superintendent of the Morris mine to superintendent. **E. E. Eidam,** foreman of the Morris mine, has been made assistant superintendent of the Godfrey, Morris, and Leonard-Burt mines. In the Virginia-Eveleth district of Minnesota, **W. R. Welton** has become superintendent of all the company's operations in Virginia. **Ira O. Swanson** has been promoted to superintendent of mines in Eveleth. **J. H. Harrison,** foreman in the Hull-Rust mine, has been named assistant superintendent of the Mountain Iron mine.

OBITUARY

Major Richard Treloar, widely known in Canadian mining circles, died recently in Toronto.

William R. Grace, first vice president of Ingersoll-Rand, of New York, died on March 31 at Two Trees, S. C. He would have been 65 years of age on April 1.

Charles C. Higgins, mining editor of the *Reno Evening Gazette* for the last 19 years, died in Reno, Nev., on March 20 at the age of 79.

Joseph Pierce Keene, mining engineer, well known in California and other Western states, died on April 1 in Grass Valley. He was 73.

Herbert E. Willson, a successful placer gold miner in the Fairbanks area of Alaska, died in Seattle, Wash., on April 3 at the age of 71. He made a fortune on Cleary Creek and in the Tanana Valley.

Eugene Frost, assistant general manager of the explosives department and member of the board of directors of the Atlas Powder Co., died on April 20 at Ardmore, Pa., at the age of 54.

Ora L. Wilson, of Spokane, Wash., died in Denver on April 8 at the age of 61. Mr. Wilson had been vice president of the International Union of Mine, Mill and Smelter Workers since 1936 and was well known in the Northwest.

William M. Weigel, former president of the A.I.M.E., died in St. Louis, Mo., on March 26 last. Mr. Weigel, 64, was mineral technologist for the Missouri Pacific Railroad, a position he had held since 1926.

Robert Brady Van Buskirk, a widely known mining engineer, died in Phoenix, Ariz., on March 22 last. He was formerly mine superintendent at the property of Andes Copper, in Chile, and had been associated with other South American enterprises as well as with the Walker mine, in California, and Inspiration, in Arizona.

Thomas H. Tulloch, mining engineer, who graduated from Columbia University in 1907, and who had been professionally active in Mexico, Arizona, New Mexico, Utah, and Georgia before entering the employ of the city of San Diego, Calif., in a technical capacity some years ago, died in that city on April 8 at the age of 59.

William Lee Powers, who joined the American Cyanide Co. in 1918 as chief of mines, died at Little Rock, Ark., on April 18 last at the age of 52. Mr. Powers was at the time of his death general manager of the company and for many years had been in charge of its bauxite mining operations in Arkansas.

Lic. Jose Luis Requena, 83, one of Mexico's oldest and most outstanding figures in mining and general business, who was also a noted economist, died on March 13 in Mexico City. He was founder of such important mining companies as Dos Estrellas, El Campo Morado, and La Esperanza, and had written several books on silver and economics.

Frank C. Bailey, 88, former secretary of Northwest Mining Association and one of the best known mining men in the Pacific northwest, died recently at his home in Spokane, Wash. He was connected with mine development in the Coeur d'Alenes and elsewhere in the Northwest for 35 years.

Percy E. Barbour, consulting mining engineer, former managing editor of *Engineering and Mining Journal* and former secretary of the Mining and Metallurgical Society of America, died in Lima, Peru, on May 4 at the age of 67. He was attached to the United States Embassy there as senior technical analyst for the State Department.

John T. Burrows, of New York, died in Rapid City, N. D., on April 27, at the age of 59. Mr. Burrows was formerly president of Union Potash & Chemical Corp. and vice president of International Minerals & Chemical Corp. He was also president of Phosphate Recovery Corp. until Minerals Separation North American Corp. acquired 100 percent ownership, when he became vice president of the last-named organization.

John Amos McLaughlin, widely known and highly regarded mining engineer, died in Vancouver on April 14. He was born in the Eastern Townships of Quebec in 1876 and had been engaged in the mining industry of British Columbia since 1899. He was identified with the Granby operation at Phoenix as mucker, miner, timberman, blaster, shift boss, assistant foreman, and foreman, and following the closing of the mine was appointed mine superintendent of the company's Copper Mountain mine. He resigned in 1930 to accept a two-year contract with the Russian Government in the Ural area.

Edwin Patrick Ryan, vice president and general manager of El Potosi Mining Co., at Potosi, Chihuahua, Mexico, died in El Paso, Tex., on March 31 last, at the age of 64. He was a graduate of the Michigan College of Mines and had had professional experience in mining in Arizona and Sonora, Mexico, before becoming manager of El Cubo mine, at Juanajuato, Mexico. Later he became a member of the firm of Ryan, Brennan & Carpenter, consulting engineers of Mexico City, following which he was appointed manager of Cusi Mining Co. at Cusihuiriachic, which he left in 1924 to take over the management of El Potosi, a subsidiary of the Howe Sound Co., of New York, in which post he continued until his death.

An Appreciation of Julius W. Hegeler

Julius W. Hegeler, president of The Hegeler Zinc Co., of Danville, Ill., died of pneumonia in Washington, April 13, 1943, after a short illness. He was in his 76th year. He left his wife, one son (Edward C. Hegeler), and three daughters; and eight grandchildren.

Julius Hegeler was a noteworthy figure as one who was born and brought up in the zinc business, in which he was engaged all his life, and leaving a son who was also born and brought up in the business. This is a family record similar to that of certain distinguished families in the zinc industry of Europe.

In 1857 F. W. Matthiessen and Edward C. Hegeler came to the United States fresh from the School of Mines at Freiberg, Saxony, and obtained permission from the Lehigh Zinc Co. to experiment at a tiny plant abandoned as a failure for the reason that no one in the company then knew how to produce spelter from zinc ore. Matthiessen and Hegeler demonstrated that they could do so, but failing to come to an agreement for building works they turned their attention to the west, where they studied the zinc deposits of Wisconsin, and late in 1858 began the erection of the present works at La Salle, which went into operation in 1860 and have been in continuous operation ever since. This was practically the beginning of American zinc smelting.

Edward Hegeler married Camilla Weisbach, a daughter of Dr. Julius Weisbach, the distinguished professor of applied mechanics at Freiberg. Julius was born at La Salle, Sept. 18, 1867. Other children were his brother Herman, also associated with the zinc business, and five sisters, one of whom, Mrs. Carus, continued to live at La Salle after her marriage and in the course of time became president of the Matthiessen & Hegeler Zinc Co., subsequently to the death of her father, which was in 1910.

Julius was graduated in mechanical engineering from the University of Michigan in 1889. He married Miss Josephine Caesar in 1897. In 1905 he moved to Danville, together with his brother Herman, with the idea of instituting their own zinc smelting plant there, under the name of Hegeler Brothers. This plant was completed in 1907, but it was not put into operation until 1908. It was laid out on the lines of La Salle, and as an integrated plant, with its own coal mine, roasting and distilling furnaces, sulphuric acid manufacture, and later a zinc rolling mill, the latter being one of the first examples of zinc strip rolling, and a model plant. Otherwise Julius did not introduce many innovations at Danville, but in benefiting from his prior experience at La Salle his designs and constructions were always good, evincing his strong mechanical sense.

Herman died in 1913. In 1914 the name of the company was changed to The Hegeler Zinc Co., and thenceforward Julius was alone in directing the plant, which became the leading industry of Danville, and himself the leading citizen of that community. Following his death the industrial, business, and civic leaders of Danville united in drafting and publishing a remarkable tribute to the accomplishments of Julius Hegeler and his contributions to the welfare of their city and their appreciation of his high qualities as a man of honor, generosity, and friendliness.

In the zinc industry there is an equal appreciation of him for the same sterling qualities, besides a deep appreciation of his great experience in the metallurgy and manufacturing of zinc and his sound sense in engineering and economics. In the zinc industry he was liked and esteemed by everyone and was an important figure.

Julius Hegeler joined the American Institute of Mining and Metallurgical Engineers in 1892 and in 1942 passed to its honor roll of members of 50 continuous years. He was one of the incorporators of the American Zinc Institute when it was organized in 1918, serving on its board of directors for a quarter of a century, being earnest in his attention to its affairs. He was also a member of the American Mining Congress.

W. R. INGALLS

A LETTER

The Electron Microscope

IN RESPONSE to a query as to his opinion as to the possibilities of the electron microscope in the field of ore dressing and metallurgy, Mr. R. E. Head, microscopist on the staff of the United States Bureau of Mines, writes as follows:

THE EDITOR:

I have been following with interest the developments of the new electron microscopes, but as yet I am not certain to what extent microscopes of this type may be useful in ore dressing. We have no difficulty in visualizing extremely small mineral inclusions with the conventional microscope. As a matter of fact, the ordinary microscopic methods are satisfactory for determining intimacy of mineral associations which are too small to be successfully separated by mechanical ore-dressing methods, although they may be amenable to leaching treatment.

There is one phase of mineral study for concentration purposes that has been largely overlooked—namely, that of determining accurately the surface conditions existing on minerals that are treated by flotation. It may be that the electron microscope might have an application to this field and elicit information which is not obtainable through study with the conventional ore-dressing microscope. It should also have a definite application in the field of ceramic materials such as clays which are now being processed and concentrated in much the same manner as are the metallic minerals. Undoubtedly the use of the electron microscope and its fields of application are a matter for research, and pioneering and future developments will undoubtedly be surprisingly illuminating.

R. E. HEAD

Summary of the MARKETS

PRICE DEVELOPMENTS in major non-ferrous metals were lacking during April, and the *E. & M. J.* index continued at 88.74 percent of the 1922-2 average for the eighth consecutive month. The Interstate Commerce Commission announced that the 6 percent freight rate increase, in effect since March 18 of the current year, is to be suspended on May 15 until Jan. 1, 1944.

President Roosevelt on April 29 signed a bill extending the $2,000,000,000 stabilization fund for two years. The measure prevents use of the fund in creation of an international bank and drops the authority of the President to devalue the dollar.

The supply situation in silver is such that another move has been started to amend the Silver Purchase Act of 1934 to free metal now frozen under that law for use in war and essential civilian products. Supplies for 1943 from all sources are estimated by WPB at 162,000,000 oz. Estimated consumption for

UNITED STATES MARKET

1943 April	Electrolytic Copper—Domestic (a) Refinery	Electrolytic Copper—Export (b) Refinery	Straits Tin New York	Lead—New York	Lead—St. Louis	Zinc St. Louis
1	11.775	11.700	52.000	6.50	6.35	8.25
2	11.775	11.700	52.000	6.50	6.35	8.25
3	11.775	11.700	52.000	6.50	6.35	8.25
5	11.775	11.700	52.000	6.50	6.35	8.25
6	11.775	11.700	52.000	6.50	6.35	8.25
7	11.775	11.700	52.000	6.50	6.35	8.25
8	11.775	11.700	52.000	6.50	6.35	8.25
9	11.775	11.700	52.000	6.50	6.35	8.25
10	11.775	11.700	52.000	6.50	6.35	8.25
12	11.775	11.700	52.000	6.50	6.35	8.25
13	11.775	11.700	52.000	6.50	6.35	8.25
14	11.775	11.700	52.000	6.50	6.35	8.25
15	11.775	11.700	52.000	6.50	6.35	8.25
16	11.775	11.700	52.000	6.50	6.35	8.25
17	11.775	11.700	52.000	6.50	6.35	8.25
19	11.775	11.700	52.000	6.50	6.35	8.25
20	11.775	11.700	52.000	6.50	6.35	8.25
21	11.775	11.700	52.000	6.50	6.35	8.25
22	11.775	11.700	52.000	6.50	6.35	8.25
23	11.775	11.700	52.000	6.50	6.35	8.25
24	11.775	11.700	52.000	6.50	6.35	8.25
26	11.775	11.700	52.000	6.50	6.35	8.25
27	11.775	11.700	52.000	6.50	6.35	8.25
28	11.775	11.700	52.000	6.50	6.35	8.25
29	11.775	11.700	52.000	6.50	6.35	8.25
30	11.775	11.700	52.000	6.50	6.35	8.25
			AVERAGES FOR MONTH			
April	11.775	11.700	52.000	6.50	6.35	8.25
			AVERAGES FOR WEEK			
April 7	11.775	11.700	52.000	6.50	6.35	8.25
14	11.775	11.700	52.000	6.50	6.35	8.25
21	11.775	11.700	52.000	6.50	6.35	8.25
28	11.775	11.700	52.000	6.50	6.35	8.25
			CALENDAR WEEK AVERAGES			
April 3	11.775	11.700	52.000	6.50	6.35	8.25
10	11.775	11.700	52.000	6.50	6.35	8.25
17	11.775	11.700	52.000	6.50	6.35	8.25
24	11.775	11.700	52.000	6.50	6.35	8.25

SILVER, GOLD AND STERLING EXCHANGE

1943 April	Sterling Exchange "Checks" (Nominal)	Sterling Exchange "90-day demand"	Silver (c) New York	Silver London	Gold London	Gold (d) United States
1	401.000	(f)	44.750	23.500	168s	$35.00
2	401.000	(f)	44.750	23.500	168s	35.00
3	401.000	(f)	(e)	(e)	(e)	35.00
5	401.000	(f)	44.750	23.500	168s	35.00
6	401.000	(f)	44.750	23.500	168s	35.00
7	401.000	(f)	44.750	23.500	168s	35.00
8	401.000	(f)	44.750	23.500	168s	35.00
9	401.000	(f)	44.750	23.500	168s	35.00
10	401.000	(f)	(e)	(e)	(e)	35.00
12	401.000	(f)	44.750	23.500	168s	35.00
13	401.000	(f)	44.750	23.500	168s	35.00
14	401.000	(f)	44.750	23.500	168s	35.00
15	401.000	(f)	44.750	23.500	168s	35.00
16	401.000	(f)	44.750	23.500	168s	35.00
17	401.000	(f)	(e)	(e)	(e)	35.00
19	401.000	(f)	44.750	23.500	168s	35.00
20	401.000	(f)	44.750	23.500	168s	35.00
21	401.000	(f)	44.750	23.500	168s	35.00
22	401.000	(f)	44.750	23.500	168s	35.00
23	401.000	(f)	44.750	23.500	168s	35.00
24	401.000	(f)	(e)	(e)	(e)	35.00
26	401.000	(f)	44.750	23.500	168s	35.00
27	401.000	(f)	44.750	23.500	168s	35.00
28	401.000	(f)	44.750	23.500	168s	35.00
29	401.000	(f)	44.750	23.500	168s	35.00
30	401.000	(f)	44.750	23.500	168s	35.00
			AVERAGE FOR MONTH			
April	401.000	.....	44.750	23.500	....	35.00
			AVERAGES FOR WEEK			
April 7	401.000	.....	44.750	.....	....	.....
14	401.000	.....	44.750	.....	....	.....
21	401.000	.....	44.750	.....	....	.....
28	401.000	.....	44.750	.....	....	.....

Calendar week averages, New York Silver: April 3rd, 44.750; 10th, 44.750; 17th, 44.750; 24th, 44.750.
(e) Not quoted (Saturday). (f) No quotation.

THE above quotations for major non-ferrous metals are our appraisal of the important United States markets, based on sales reported by producers and agencies. They are reduced to the basis of cash, New York or St. Louis, as noted. All prices are in cents per pound.

(a) Net prices at refineries on Atlantic seaboard. To arrive at the delivered New England basis add 0.225c. per pound, the average differential for freight and delivery charges.

(b) Export prices are net at refineries on the Atlantic seaboard and include sales of domestic copper in the foreign market. Owing to the World War and the disruption of normal trade relations, our export copper quotations, since September, 1939, have been based largely on f.a.s. transactions, ex United States ports. We deduct .05c. from the f.a.s. basis (lighterage, etc.) to arrive at the f.o.b. refinery quotation.

Copper, lead and zinc quotations are based on sales for both prompt and future deliveries; tin quotations are for prompt delivery only.

Quotations for copper are for the ordinary forms of wirebars and ingot bars; cathodes are sold at a discount of 0.125c.

Quotations for zinc are for ordinary Prime Western brands. Zinc in New York commands a premium over the St. Louis basis equal to the freight differential. Contract prices for High Grade zinc delivered in the East and Middle West in nearly all instances command a premium of 1c per pound over the current market for Prime Western but not less than 1c over the *Engineering and Mining Journal's* average quotation for Prime Western for the previous month.

Quotations for lead reflect prices obtained for commond lead, and do not include grades on which a premium is asked.

(c) Silver other than newly-mined domestic, by Handy & Harman. Under Treasury order of July 6, 1939, the price on domestic newly-mined silver mined subsequent to July 1, 1939, was fixed at 71.11c per troy ounce. Handy & Harman's quotation on newly-mined domestic silver, 999 fine was 70⅝c. throughout April.

(d) U. S. Treasury's gold price. Actual payment by the United States Treasury for gold in domestic and imported ore or concentrate is at 99.75 per cent of the price quoted by the Treasury, which at present is equal to $34.9125.

essential uses is 139,000,000 oz., with non-essential needs placed at 30,000,000 oz. Coinage requirements have increased sharply in some countries, reducing the amount available for shipment to the United States. The Mexican Government plans to use about 20,000,000 oz. for coinage this year.

The Tin Sales Corp. was organized during the month to sell the output of the smelter in Texas on a non-profit basis. The new company is a subsidiary of the Tin Processing Corp. The price of "Grade A" tin continued at 52c. a pound.

Except for some minor revisions in the regulations governing use of copper, the situation in this metal hardly changed last month. Allocation certificates came through quickly and tonnages made available held close to the high level established in prior months this year. Total supply of new copper, consisting of domestic output plus imports, continued to gain over last year. Prices were unchanged.

MONTHLY AVERAGES

Monthly averages for copper, lead, zinc, tin, silver (New York and London), gold, and sterling exchange appear on preceding page. Average prices of miscellaneous metals for February and March follow:

	Mar.	April
Quicksilver, N. Y. flask.	196.000	196.000
Antimony (a)	16.049	16.049
Antimony, bulk, Laredo.	14.500	14.500
Antimony, bulk, N. Y.	15.509	15.509
Antimony, Chinese (b).	16.500	16.500
Platinum, oz. troy	35.000	35.000
Cadmium (c)	90.000	90.000
Cadmium (d)	92.500	92.500
Cadmium (e)	95.000	95.000
Aluminum, ingot	15.000	15.000
Magnesium, ingot	20.500	20.500

(a) New York, packed in cases, in lots of 5 tons or more but less than a carload. (b) Nominal. (c) Producer's price for commercial sticks. (d) Average of producer's and plater's quotations. (e) Special shapes sold to platers.

E & M J PRICE INDEX

Weighted index of non-ferrous metal prices (copper, lead, zinc, tin, silver, nickel, and aluminum). The average for the years 1922-1923-1924 equals 100.

1929	110.33	1936	73.45
1930	82.87	1937	90.86
1931	60.20	1938	73.67
1932	48.26	1939	77.71
1933	59.79	1940	79.22
1934	69.59	1941	83.49
1935	74.66	1942	86.80

	1941	1942	1943
January	82.48	85.39	88.74
February	82.76	85.90	88.74
March	83.27	85.90	88.74
April	83.48	85.90	88.74
May	83.51	85.90	....
June	83.48	85.90	....
July	83.60	85.90	....
August	83.39	85.90	....
September	83.34	88.74	....
October	83.84	88.74	....
November	84.32	88.74	....
December	84.42	88.74	....

CURRENT PRICES—MISCELLANEOUS METALS, ORES, AND NON-METALLIC MINERALS

Quotations cover wholesale lots, prompt shipment, f.o.b. New York, unless otherwise stated

(May 1, 1943)

MISCELLANEOUS METALS

Aluminum, ingot, 99 plus per cent, lb	15c.
Antimony, domestic, spot, lb. 5 ton or more	16.049c.
Bismuth, ton lots, lb	$1.25
Cadmium, commercial sticks, lb	90c.
Calcium, lb., ton lots 97 @ 98 per cent	$1.25
Chromium, 97 per cent grade, lb	89c.
Cobalt, 97 to 99 per cent, per lb	$1.50
Nickel, electrolytic cathodes, lb	35c.
Magnesium, 99.8 per cent, carloads, lb	20½c.
Palladium, troy oz	$24.00
Platinum, (Official quotation) troy oz	$35.00
Quicksilver, flask of 76 lb., 100 flasks or more	$196.00@$198.00
Radium, mg. radium content	$25.00@$30.00
Selenium, 99.5 per cent, lb	$1.75
Silicon, minimum 97 per cent, spot, carloads lb	14.75c.
Tellurium, lb	$1.75
Thallium, 100 lb. or more, lb	$10.00
Titanium, 96 to 98 per cent, lb	$5.00

METALLIC ORES

Beryllium Ore, 10 to 12% BeO. f.o.b. mines, ton	(b)$80.00@$100.00
Chrome Ore, per long ton, f.o.b. cars Atl. ports, dry, 48% Cr_2O_3, 2.8 to 1 ratio	$41.00
48% Cr_2O_3, 3 to 1 ratio	$43.50
Iron Ore, Lake Superior, Lower Lake ports, long ton:	
Old Range bessemer	$4.75
Mesabi bessemer	$4.60
Old Range non-bessemer	$4.60
Mesabi, non-bessemer	$4.45
Lead (Galena) 80 per cent, Joplin, Mo., ton	$76.54
Manganese (dutiable) f.o.b. cars Atl. ports, long ton unit Mn:	
50 per cent	79.8c.
48 per cent	78.8c.
46 per cent	76.8c.
Manganese Ore, domestic, 48%, f.o.b. mines, l.t. unit	96c.@$1.00
Molybdenum Ore, 90%, per lb. of MoS_2, f.o.b. mines	45c.
Tungsten Ore, per unit of WO_3:	
Chinese, 65 per cent, duty paid	(b) $24.00
Domestic, 65 per cent and upward	(a) $26.00
Vanadium Ore, per lb. of contained V_2O_5 f.o.b. mines	27.50c
Zinc Ore, Prime, 60 per cent concentrate, Joplin, Mo; per ton	$55.28

(a) Prices at mines, small lots, usually several dollars less. (b) Nominal

METALLIC COMPOUNDS

Arsenious Oxide (arsenic) lb	4c.
Cobalt Oxide, 70 @ 71 per cent, lb	$1.84
Copper Sulphate, 100 lb	$5.00

ALLOYS

Beryllium Copper, 2.5 to 3 percent Be, per lb. of contained Be	$15.00
Ferrochrome, 65 @ 70 percent per pound of Cr contained	13c.
Ferromanganese, 78 @ 82 per cent, gross ton	$135.00
Ferromolybdenum 55 @ 65 per cent Mo. lb. of Mo. contained	95c.
Ferrosilicon, 50 per cent, gross ton	$74.50
Ferrotungsten, 75 @ 80 per cent, lb. of W contained	$1.90
Ferrovanadium, per lb. of V, delivered	$2.70@$2.90
Silicomanganese, 1½ per cent C, gross ton	$135.00

NON-METALLIC MINERALS

Asbestos, f.o.b. Canadian (Quebec) mines (U. S. funds), ton:	
Crude No. 1	$650@$750
Crude No. 2	$165@$385
Spinning fibers	$124@$233
Paper stock	$44@$49.50
Shorts	$14.50@$26.50
Vermont, f.o.b. Hyde Park:	
Shingle stock	$62.50@$65.00
Paper stock	$44.00@$53.00
Shorts	$14.50@$28.50
Floats	$19.50
Barytes, long ton:	
Georgia, crude	$8.50@9.00
Missouri, 93 per cent $BaSO_4$, less than 1 per cent iron	$6.75@$7.25
Bauxite, long ton:	
Domestic, crude, 50 @ 52 per cent (not dried)	$5.00
Domestic, chemical, 55 @ 58 per cent	$7.50@$8.50
Domestic, abrasive, 80 @ 84 per cent	$16.00
China Clay, f.o.b. mines, ton:	
South Carolina and Georgia, No. 1, bulk	$6.75@$8.00
Delaware, No. 1	$15.00
Feldspar, bulk, ton:	
Potash feldspar, 200 mesh	$17.00
Glass-spar, white, 20 mesh	$11.75
Fluorspar, f.o.b. mines, bulk, Kentucky and Illinois 85-5 per cent, all rail movement, ton	$28.00
Ground, 95 @ 98 per cent, bulk, ton	$34.00
Acid, 98 and 1 per cent, bulk, ton	$35.00
Fuller's earth, f.o.o. Georgia or Florida, ton	$7.00@$14.00
Magnesite, per ton dead-burned, f.o.b. Washington	$22.00

Mica—Base prices on sheet, North Carolina one-half trim, as posted by the Colonial Mica Corp., the Government's buying agency for obtaining strategic mica, per pound, follow: Sheet to cut minimum of 1½ × 2 in. $2.40; 2 × 2 in. $3.52; 2 × 3 in. $4.64; 3 × 3 in. $5.12; 3 × 4 in. $6.08; 3 × 5 in. $7.04; 4 × 6 in. $8.00; 6 × 8 in. $9.12; punch, 30c. Premium and discounts up to 40 percent, depending on quality and trim. Scale does not apply to non-strategic mica.

Ocher, Georgia, ton	$19.00@$22.00
Pyrites, Spanish, per long ton unit of S, c.i.f. Atlantic ports	12c., nom.
Silica, in bags, 325 mesh, ton	$20.00@$40.00
Sulphur, Texas, mines, long ton	$16.00
Talc, f.o.b. works, ton:	
New York, double air-floated, 325 mesh	$12.00@$15.00
Vermont, extra white, 200 mesh	$9.50@$10.50
Tripoli Missouri, ton:	
40 mesh, cream colored	$14.50
200 mesh, cream colored	$26.00

IRON AND STEEL

Pig Iron, Valley furnaces, gross ton: Basic	$23.50
Steel, base prices, Pittsburgh Billets, gross ton	$34.00
Structural shapes, 100 lb	$2.10

New Books

POTASH IN NORTH AMERICA. *By J. W. Turrentine, President, American Potash Institute. Reinhold Publishing Corp., 330 W. 42d St., New York. Pp. 181. Price $3.50.*

THOSE who recall their concern over the country's lack of potash in the first World War, when imports of this material from Europe stopped abruptly, must view with satisfaction the stable domestic industry that now thrives in the United States, wholly independent of foreign sources of supply. In 1926, approximately midway in the period that might be said to embrace the history of this industry, Dr. Turrentine presented his well-known book "Potash: A Review, Estimate and Forecast," wherein he set down the results of research in the 15-year period then ending, from the time in 1911 when federal aid inaugurated such research. In concluding, he expressed his confidence that America's resources ultimately would be exploited successfully. That day has since arrived. In the new volume, the author resumes where he left off in 1926, reviewing first the happenings of the last 15 years: next discussing the uses developed for potash in American industries; and then taking up the current technology of potash production. The book presents an excellent picture of the industry and its operations.

In conclusion, though hesitating to forecast the future, Dr. Turrentine says he feels sure the American people will be sensible enough to safeguard the permanence and prosperity of this industry. Its independence is certain to be challenged, he feels, when international trade returns with the restoration of peace.

DICTIONARY OF SCIENCE AND TECHNOLOGY IN ENGLISH-FRENCH-GERMAN-SPANISH. *By Maxim Newmark. Published by Philosophical Library, Inc., 15 East 40th St., New York. Pp. 886. Price $6.*

MR. NEWARK'S book is composed of four divisions. The first, having 205 pages, is the polylingual dictionary, in which 10,000 English terms used in science and technology are listed, the French, German, and Spanish equivalent being given for each term. Under each letter of the alphabet the English words are numbered serially. Thus under "A" the 716 words from "abacus" to "azurestone" are numbered from 1 to 716.

Then follow three 57-page sections in order. The first of these is an alphabetical index of French terms, the second an index of German terms, and the third an index of Spanish terms. In each of these indexes, each foreign word listed is followed by the initial letter and serial number of the equivalent English word, so that it can be located in the four-language dictionary.

The arrangement thus described is useful. The value of the book depends of course upon the care with which the 10,000 English terms have been chosen. Mining and metallurgy are poorly represented. On the other hand, it is difficult to see why such words as "remove," "renew," and "reorganize," to pick some at random, are selected for such a list.

WORLD MINERALS AND WORLD PEACE. *By C. K. Leith, J. W. Furness, and Cleona Lewis. The Brookings Institution, Washington, D. C., Pp. 246. Price. $2.50.*

AS STATED in the introduction, "The purpose of this book is to present a factual study of trends in the mineral field—physical, economic, and political—and in the light of these trends to analyze the possibilities of controlling minerals to prevent preparation for war." This purpose is competently achieved, giving a wealth of facts in compact and interesting style, with objective treatment and full opportunity for the reader to make up his own mind in the light of the facts. The book does not attempt to set up a definite, detailed plan of postwar mineral control, but sketches the background for such a plan. Probably this is as far as it is feasible to go at the present time, until the outlines of the postwar world become more distinct.

Among the facts highlighted in Part I, "Physical and Commercial Trends," are: the vital importance of minerals in modern industrial economy; the unequal distribution by nature and the impossibility of altering the broad geography of mineral production; the lack of complete self-sufficiency by any nation or continent; and the domihant position of the United States and British Empire in ownership and control of the principal world mineral supplies.

Part II, "Recent Trends in Political and Economic Control," discusses various attempts at control in the past, including cartels, tariffs, quotas, preferential agreements, and "closed-door" policies. It also describes efforts by various nations to achieve mineral self-sufficiency.

Part III, "The Future," brings experience to bear on the future, with particular reference to the commitments and implications of the Atlantic Charter. It points out that complete "access, on equal terms," is impossible, that there was no important discrimination against the acquisition of mineral supplies by "have-not" nations in prewar days, and that the effect of import tariffs was not to reduce accessibility of raw materials to "have-not" nations, but was to impair their purchasing power. It emphasizes that the principal reason why the Axis nations were embarrassed in obtaining raw materials was because they were dislocating their economies by preparation for war.

The book stresses the impracticability of attempting to stop war after belligerent nations are prepared and an act of aggression has already been committed. It points out the necessity of denying "suspect" nations the surplus raw materials necessary to prepare for war. Nevertheless, it is realistic in pointing out many difficult complications inherent in such a policy.

PUBLICATIONS
RECEIVED

Copper Mineralization Near Salmon, Idaho. Pamphlet 60. Idaho Bureau of Mines and Geology, Moscow, Idaho. Pp. 15.

The Asbestos Factbook. A 16-p. pamphlet summarizing the qualities, occurrences, and uses of asbestos. Price 10c. Address Asbestos, Inquirer Bldg., Philadelphia, Pa.

Peace and War. United States Foreign Policy. A decade of relations of the United States with Japan, Germany, and Italy. For sale by the Superintendent of Documents, Government Printing Office, Washington, D. C. Price 25c.

How Management Can Integrate Negroes in War Industries. Committee on Discrimination in Employment, New York State War Council, Albany, N. Y.

Oklahoma. "Mineral Resources and Mineral Industries—An Outline for Future Development in Oklahoma." Directors' biennial report, Oklahoma Geological Survey, Norman, Okla. Pp. 48.

The U. S. Geological Survey has issued the following bulletins. Copies may be obtained from the Superintendent of Documents, Washington, D. C., at the price stated in each case.

"Tin-Spodumene Belt of the Carolinas." Preliminary report. Bulletin 936-J. Pp. 245-269, plus map. Price 50c.

"The Three Kids Manganese District, Clark County, Nevada." Bulletin 936-L. Pp. 297-319, plus map. Price 30c.

"Nickel-Copper Deposit at Funter Bay, Admiralty Island, Alaska." Bulletin 936-O. Pp. 349-361. Price 15c.

"Basin and Range Province in Utah, Nevada, and California." Professional Paper 197-D. Pp. 141-196. Price 15c.

"Some Standard Thermal Dehydration Curves of Minerals." Professional Paper 197-E. Pp. 197-217. Price 5c.

"Geology and Ore Deposits of Chichagof Mining District, Alaska." By J. C. Reed and R. C. Coats. Bulletin 929. Pp. 148, plus 14 maps. Price $3.25. After devoting 85 pages to the geology and ore deposits, this report describes the Chichagof and Hirst-Chichagof mines in detail and gives short accounts of numerous other mines and prospects.

"Stratigraphy, Structures, and Mineralization in the Beaver-Tarryall Area, Park County, Colo." By Q. D. Singewald. Bulletin 928-A. Pp. 44, plus maps. Price 15c.

"Manganese Resources of the Olympic Peninsula, Washington." By C. F. Park, Jr. Bulletin 931-R. Pp. 432-457, plus maps. Price 35c.

"Quicksilver Deposits of the Parkfield District, California." By E. H. Bailey. Bulletin 936-F. Pp. 143-169, plus map. Price 35c.

"Quicksilver Deposits Near the Little Missouri River, Pike County, Arkansas." By David Gallagher. Bulletin 936-H. Pp. 111-219, plus maps. Price 55c.

"Occurrences of Molybdenum Minerals in Alaska." By Philip S. Smith. Bulletin 926-C. Pp. 161-210. Price 15c.

"Mineral Industry in Alaska in 1940." By Philip S. Smith. Pp. 102. Price 35c.

"Tungsten Deposits of Nightingale District, Pershing County, Nevada." By W. C. Smith and P. W. Gould. Bulletin 936-B. Pp. 39-58, plus map. Price 40c.

NEWS OF THE INDUSTRY

Mine, Mill, and Smelter Workers Union (CIO) Wins Several Cases Before WLB and NLRB

Decisions involve 23 companies and 29 operating sites and include elections, recognition, wage increases, maintenance of membership, check-off, and vacations

DURING APRIL the Mine, Mill and Smelter Workers Union (CIO), with headquarters in Denver, Colo., won a number of victories in decisions handed down by the National Labor Relations Board and by the Nonferrous Metals Commission of the War Labor Board. Decisions of the latter agency were pursuant to hearings held in Denver, its headquarters, during the past several weeks.

In compliance with the petition of the union, the NLRB ordered elections among employees to determine collective bargaining agencies at the Consolidated Coppermines Corp. property at Ely, Nev., and at the plant of Basic Magnesium, Inc., near Las Vegas, Nev., now operated by Anaconda. The first election was to be held within 30 days of April 15 and the second within a like period of April 16. Pursuant to elections held by the board, the union was recognized as bargaining agency for the employees of the Monticello, Utah, plant of Vanadium Corp. of America and the Morenci mine and smelter operations of Phelps Dodge. In the latter case a contract the company had made with the A. F. of L. was upset.

The WLB decisions involved operations in all parts of the country. At the Phelps Dodge refinery at El Paso, Tex., workers were granted a 11¼c. per hour increase in pay, retroactive to Oct. 1, 1942; maintenance of membership, check-off, and one-week vacations. Employees of the refinery of the same company at Long Island City, N. Y., were granted the same privileges, except that the wage increases was 5c. per hour, retroactive to Sept. 18, 1942.

Wage increases were granted to employees of five plants of American Smelting & Refining Co., at Leadville, Colo.; Perth Amboy, N. J.; Newark, N. J.; Denver, Colo. (Globe refinery); and Omaha, Neb. The increase at the first plant was 11¼c. per hour, retroactive to Aug. 1, 1942; at the next three plants, 5c. per hour, retroactive to July 1, 1942; and at the Omaha plant, 3¾c. per hour, retroactive to Sept. 30, 1942.

Pay increases of 26c. per shift retroactive to Feb. 20, 1943, were granted to employees of the Miami Copper Co., Inspiration Consolidated Copper Co., and the Inspiration smelter of International Smelting & Refining Co. All these operations are at Miami and Inspiration, Ariz. Maintenance of membership, check-off, and one-week vacations were also granted.

The commission awarded employees of six companies operating manganese properties at Philipsburg, Mont., a $1 per shift pay increase, retroactive to July 1, 1942.

Calumet & Hecla Consolidated, largest Michigan copper producer, was ordered to raise wages $1 per day and submit to a maintenance of membership contract. A similar order was issued to the Herculaneum lead smelter of the St. Joseph Lead Co., at Herculaneum, Mo., retroactive to Sept. 19, 1942, adding one- and two-week vacations.

Five Tri-State district mining companies were ordered to give wage increases of 50c. per shift, retroactive to various dates between Aug. 21, 1942, and Jan. 6, 1943.

Employees of the Chewelah, Wash., plant of Northwest Magnesite Co. were granted a raise of 5c. per hour, retroactive to July 1, 1942.

The Bayard, N. M., operations of United States Smelting, Refining & Mining Co. were ordered to grant the union maintenance of membership and check-off. Wages were not an issue, as the company had joined in a petition to raise wages and permission was given on March 9.

Crane Optimistic Over Long-Range Outlook

IN HIS ANNUAL REPORT to stockholders covering 1942 operations, Clinton H. Crane, president of the St. Joseph Lead Co., stated that the company's 1942 production was the greatest in its history and that he considered the long-range outlook favorable for owners of large mineral deposits.

Predictions at this time are difficult, Mr. Crane stated, with most persons pessimistic in reference to base metals, which is reflected in the values placed on the securities of long-established and well-run mining companies. As a reason for this cautious attitude he referred to the view held in many quarters that use of metals will decline sharply when hostilities cease, followed by a slump in earnings. "My own feeling," Mr. Crane said, "is that this will be a temporary situation. Mineral resources are being depleted much more rapidly than new ore deposits are being found. Thus not next year but in the future, owners of large mineral deposits will benefit, and that is one of the reasons St. Joseph Lead Co. recently purchased 195,000 shares of the New Jersey Zinc Co." Purchase of the stock cost $11,651,350.

North Carolina Has New Copper Mine

THE first load of copper sulphide concentrate from a new mine near Bear Creek, N. C., has been shipped, according to C. C. Daugherty, head of Chatham Copper Co., Inc. This is the first shipment of copper sulphide concentrate from North Carolina, stated Daugherty, who explained that all the copper is going into the war effort.

Government Competition Irks Mica Producers

ACCORDING to the *Tri-County News*, a local newspaper at Spruce Pine, N. C., in the country's most important mica-producing district, local operators are aroused over entrance of the government into competition with private capital in mica mining. The principal source of irritation was the sale by the RFC to its own subsidiary, Colonial Mica Corp., of the J. E. Burleson mines for the sum of $20,000, despite the circumstance that a private interest had offered $30,000, the newspaper reports.

According to the Washington office of the RFC, the action was taken to insure the speediest possible production of the mica so sorely needed in the war production program, previous efforts to secure production from the properties through private enterprise having failed.

Raskob Sells Ancient New Mexico Mine

JOHN J. RASKOB, General Motors magnate, has recently sold the old San Pedro mine, in Santa Fe County, N. M., which he acquired in 1938, to Dexter Hunter, of New York. Hunter, who is on leave from Cluett-Peabody & Co., clothing manufacturers, claims that the First National Bank of Chicago is associated with him in the new enterprise. The new owners intend to revive production at the mine immediately, it having been closed since November of 1941.

The San Pedro mine, which has been worked since the early Spanish days, is a copper-gold-silver producer. It was taken over by Raskob Mining Interests, Inc., under the management of C. L. Bradbury, of Albuquerque, who had previously been associated for several years with the largest Bolivian tin producer, Patiño Mines & Enterprises Consolidated. A 150-ton mill was built and placed in operation early in 1940. During that year the property produced 34,968 tons of ore, of which 31,671 tons was milled, the remainder being shipped to the smelter without milling. Total metal output during the year was 2,611 oz. gold, 32,562 oz. silver, and 1,434 tons of copper. Bradbury will also manage the property for the new owners.

Few Changes in Latest WPB Critical List

IN THE LATEST REPORT (No. 8) on the status of materials used in war and essential civilian production, the War Production Board now lists osmium, rhodium, columbium, and metallic calcium as being relatively tighter than at the beginning of the year. The important base metals have shown no change, with copper, zinc, tin, aluminum, and magnesium still viewed as "most critical." Lead and antimony remain in the group of materials that are in sufficient supply.

Group 1, covering metals and alloys that are insufficient in supply either for war demands alone or for war plus essential civilian demands, follows:

Aluminum; cadmium; bismuth; tin; magnesium; copper; zinc; tantalum; beryllium; lithium; iridium; osmium; rhodium; molybdenum; nickel; vanadium; tungsten; chromium; columbium; calcium; silicon metal; chrome-nickel stainless steel; straight chrome stainless steel; AISI, SAE, and NE alloy steels; tool steel; low-phosphorus pig-iron; alloy cast iron; open-hearth carbon steel; steel bars, forgings, seamless tubing, plates, sheet and strip, bars, wire rope, wire products except wire mesh reinforcing, castings; tin-plate; terneplate; galvanized sheet.

Miscellaneous products in Group 1 include the following:

Calcined alumina; aluminum oxide abrasives; aluminum pigments; long-fiber asbestos; low-silica bauxite; petroleum coke; corundum; metallurgical fluorspar; flake and lump graphite; block mica; quartz crystals; chrome, high-alumina, and India kyanite refractories; and spodumene.

Metals in Group II listed as being in sufficient supply for war and essential civilian products are:

Platinum; ruthenium; mercury; indium; silver; palladium; cobalt; low-carbon ferromanganese; ferrotitanium; zirconium and alloys; silicomanganese; ferrosilicon; spiegeleisen; silvery iron; various basic irons and steels; lead-coated sheets; black plate; pipe; rails; structural steel; piling; and reinforcing bars and wire mesh.

Group III, which embraces materials available in sufficient quantity for use as substitutes for the more critical materials, includes the following metals:

Antimony; antimonial lead; ferroboron; ferrocarbontitanium; high-carbon ferromanganese; lead; and gold.

Report on Detection Of Nitrogen Oxides

THE U. S. Bureau of Mines announces publication of a report on a method of determining small percentages of the oxides of nitrogen, highly toxic gases which are sometimes produced in blasting, particularly in wet places or where the explosive reaction has been incomplete.

The report is R. I. 3687, entitled "Determination of the Oxides of Nitrogen by the Phenosulfonic Acid Method," by Robert L. Beatty and L. B. Berger. It may be obtained from the Bureau of Mines, Washington, D. C.

Committee Report on Bolivia Released

THE REPORT of a commission which investigated Bolivian labor and living conditions, headed by Calvert Magruder, U. S. Circuit Judge, of Boston, Mass., has been released in La Paz. The investigation was prompted by labor unrest in Bolivian mines that threatened the continued supply of tin ores and concentrates from Bolivia, principal source available to the United Nations.

The commission found many unsatisfactory conditions in the Bolivian mines; however, it noted that these should be weighed against a very low general living standard, and that most of the miners are better paid than average workers. A major problem is an important increase in living costs since the Chaco war with Paraguay.

The report conceded that some of the mining companies were furnishing their workers with clean and wholesome dwellings of simple construction, free medical care, creditable schools for children, recreational facilities, and were selling them the essentials of life at less than cost in company stores. On the unfavorable side, the report noted that despite substantial increases, the "real" wages of Bolivian mine workers have declined, that in many cases living and sanitary conditions make the quarters provided "unfit for human habitation," that child labor laws are violated, pulmonary diseases are excessively high, and that "free association and collective bargaining" are totally absent.

The commission recommended a broad program of social development, including safety and health legislation, a minimum-wage and maximum-hour law, unemployment insurance, better educational facilities, collective bargaining, and social security. In the mines it suggests wider use of dust prevention and safety measures.

The general tenor of the report does not suggest that the conditions which resulted in mine labor disturbances are susceptible to quick improvement or can be corrected by measures applicable only to the mining industry.

Will Inspect Quartz Crystals in Brazil

AN INSPECTION laboratory has been established in Rio de Janeiro, Brazil, by the Army Signal Corps for the selection of suitable quartz crystals, the War Department announced late in April. Lieut. Col. Herbert G. Messer, special representative of the Army Signal Corps, believes that the introduction of scientific inspection procedure at the source will result in saving both time and cargo space in the shipment of this important raw material, used to provide accurate frequency control in radio equipment.

Deposits of quartz crystals have been worked in four regions in Brazil, including the poorly accessible Tocantins River district. Veins are located by independent pick-and-shovel prospectors, who mine the crystals by crude hand methods.

Gold Order Depopulates Black Hills Towns

ONLY about half of the 919 miners who were left unemployed in the Black Hills of South Dakota when gold mining operations were halted by the War Production Board last fall have been placed in other mining jobs, according to figures released by A. W. Sandell, area representative of the War Manpower Commission. Of the 919 workers who were displaced by the order, the report said, 393 were placed in Western nonferrous metal mines and several were placed in mines in other parts of the United States out of the 515 who were referred to mining companies.

Two hundred workers, the report said, were referred to employment in defense construction work, shipbuilding, essential farming, foundries, sheet-metal shops, and defense industries, 100 were placed in the Black Hills ordnance depot at Provo, and 175, who were unable to work in some essential activity or had independently secured defense work, were granted permission to accept employment in other defense areas.

A companion order to the gold mining suspension edict had prohibited Western employers from hiring displaced gold miners without permission of WMC.

Hundreds of families have moved from the Black Hills because of the gold mining suspension. In the mining community of Lead, where the Homestake gold mine is located, and nearby Deadwood, 568 electric power accounts have been dropped and 300 telephones have been disconnected.

More men will be released by the Black Hills mines in June, when milling operations must cease. Milling of broken ore has been permitted at two mines—the Homestake and the Bald Mountain at Trojan—since October, but June 8 has been set as the deadline for these milling operations. At Trojan about 40 of the regular 80 employees have been retained since October in milling and maintenance work. The Homestake is still employing about 900 workers in milling and essential activities, some of which, such as lumbering and foundry work, will be continued.

Also affected by the order in the Black Hills was the Canyon Corp. mine at Maitland, near Deadwood, which closed in December. A fourth Black Hills gold mine, the Holy Terror, at Keystone, voluntarily closed earlier because of a labor shortage.

Develop Substitute For Strategic Mica

PRIORITIES have been granted for the immediate construction of a plant for the production of "Polectron," a material that has been developed by the General Aniline & Film Corp. to serve as a substitute for strategic mica. The synthetic is now undergoing further experimentation, pointed toward the solution of electronic problems important to the war effort. The company, in announcing the product, claims that one ton of the synthetic substance fabricated into replacement material will supplant from 10 to 15 tons of block mica.

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CALIFORNIA

Hecla Will Increase Blue Moon Output

New chrome concentrator at Downieville—Atolia exhausts old tailings supply — Tuolumne Gold resumes operations

▶A 100-ton chrome concentrator was placed in operation recently at the Oxford mine, near Downieville, Sierra County, held under lease from the Oxford Mining Co. by C. L Best, owner and operator of the Ruby drift gravel mine, at Goodyear Bar. The chromite is mined by open-pit methods and the output trucked to the mill. L. L. Huelsdonk is superintendent, and 15 men are employed.

▶Development work is in progress at the Valley View mine, worked by Goodwin Trent under a lease granted by Judge J. B. Landis, the owner. The property is near Lincoln, Placer County, and ore mined in the past contained good values in copper and zinc. A RFC loan was secured recently by Trent, who also operates the Buzzard mine, in Placer County.

▶Hecla Mining Co. is operating the Blue Moon mine, near Hornitos, Mariposa County, under lease and option to the company from Red Cloud Mines, Inc. The property is opened by a 175-ft. shaft, and recent diamond drilling has disclosed a considerable tonnage of zinc ore with small quantities of gold, silver, and copper. Plans are being completed for a 200-ton daily production, and a gold mill about 5 miles distant has been leased and will be remodeled to handle mine output. Robert H. Dunn, superintendent, is in charge of operations.

▶Two more dredging companies have been granted permission by WPB to continue limited operations for a period of six months. Tuolumne Gold Dredging Co. has started up its dredge at LaGrange, Stanislaus County, with E. A. Julian, manager, in charge of operations, and one out of three dredges of Gold Hill Dredging Co. is active again in the Comanche area of Calaveras County, M. L. Summers, superintendent, directing the work.

▶Several promising chrome and manganese deposits are under exploration in Plumas County. Sundown Mining is developing some chrome holdings in the Rock Creek area, George Maxwell has uncovered some good manganese ore at his Gibraltar mine, near Crecent Mills, and production of manganese ore is scheduled to start soon at the Haunganese property, where a road and ore loading facilities have been completed.

▶J. E. Morhardt and H. V. van Loon, owners and operators of the Scheelore tungsten mine, 40 miles northwest of Bishop, Inyo County, plan early installation of a milling plant to replace the pilot unit operated a short time ago. The property was recently recognized as a new producer by MMC. A good grade of tungsten ore has been developed in No. 3 orebody, and additional ground is to be explored. Work is proceeding on the 11-mile road leading to the mine.

▶Atolia Mining Co., operating tungsten properties at Atolia, Kern County, has completed milling the tailings of material treated during the first World War and has closed down the flotation plant. The gravity section of the mill is operating normally, handling ore from underground operations. Hugh Coke is superintendent.

▶Production of copper-zinc ore is scheduled to commence soon at the Big Bend mine, in Butte County, which has been under development for several months by Hoefling Brothers, of Sacramento. W. E. Messner, superintendent, is in charge of operations. The company also operates the Spud Patch tungsten placers, in the Atolia area of Kern County, and owns the Surcease gold mine, in Butte County, closed down by WPB order suspending gold mining.

ARIZONA

Senate Committee Holds Hearings on Mining

Operators object to red tape and confusion—Boggs and Hackberry mines to be reopened—Legislature establishes occupational disease fund

▶The Mining Subcommittee of the Senate Small Business Committee held hearings in Tucson, Phoenix, and Prescott on April 5, 6, and 7, respectively. Senator Scrugham, of Nevada, is chairman of the committee. Others in attendance were Senator James Murray, of Montana, who is chairman of the Small Business Committee; Senator C. Douglas Buck, of Delaware; Representative Charles A. Plumley of Vermont, and Dr. Wilbur Nelson, of WPB. The entire group was in attendance at the hearings in Tucson and Phoenix. The hearing in Prescott on the seventh was held by Senator Buck and William Broadgate, formerly of Prescott, the last named serving as consultant to the subcommittee. Many small mine operators were heard at each meeting. The complaints voiced touched on practically every phase of the regulations now in force as a part of the government wartime control of industry, with especial emphasis on various forms of governmental interference and "red tape," together with the confusion caused by conflicting orders and directives, all of which constitute a serious handicap to operations. Prices were more discussed than any other topic. The threat to operators whose ores carry principally gold and silver, but are valuable for fluxing purposes, came in for a considerable amount of discussion. The importance of these fluxing ores to the smelters was substantiated by smelter representatives. These criticisms were answered in part by a representative of the production division of the WPB Copper Branch, assuring both producers and smelters that no mine producing fluxing ore will be closed because its ores contain principally gold and silver. Criticism of the annoying red tape was not made in generalities, but specific cases were cited. Among the restrictions severely criticised was the regulation regarding the storage of explosives by the small miner. The devious procedure to be followed in applying for an access road, and regulations which govern the payment of bonuses, were also the subjects of complaint. Decisions made in Washington by the mining division of the RFC were severely rapped. Priorities were discussed only to a limited extent and the subject appears to be causing less trouble to the small operator. During the recess between morning and afternoon sessions in Phoenix the committee attended the Kiwanis weekly luncheon. As speaker of the day Senator Scrugham discussed the recently proposed plan of Secretary Morgenthau for an international currency system, expressing doubt as to the probable success of such a system because silver was not included. He expressed doubt, also, as to the wisdom of using the wealth of this country, which holds the bulk of the world's gold, to back the proposed currency system.

▶Operations of the Shattuck Denn Mining Co. at the 79 mine, near Hayden Junction, under the direction of George A. Warner, will be greatly facilitated by the completion of the newly constructed access road. This road has reduced road distance from mine to county highway about 50 percent.

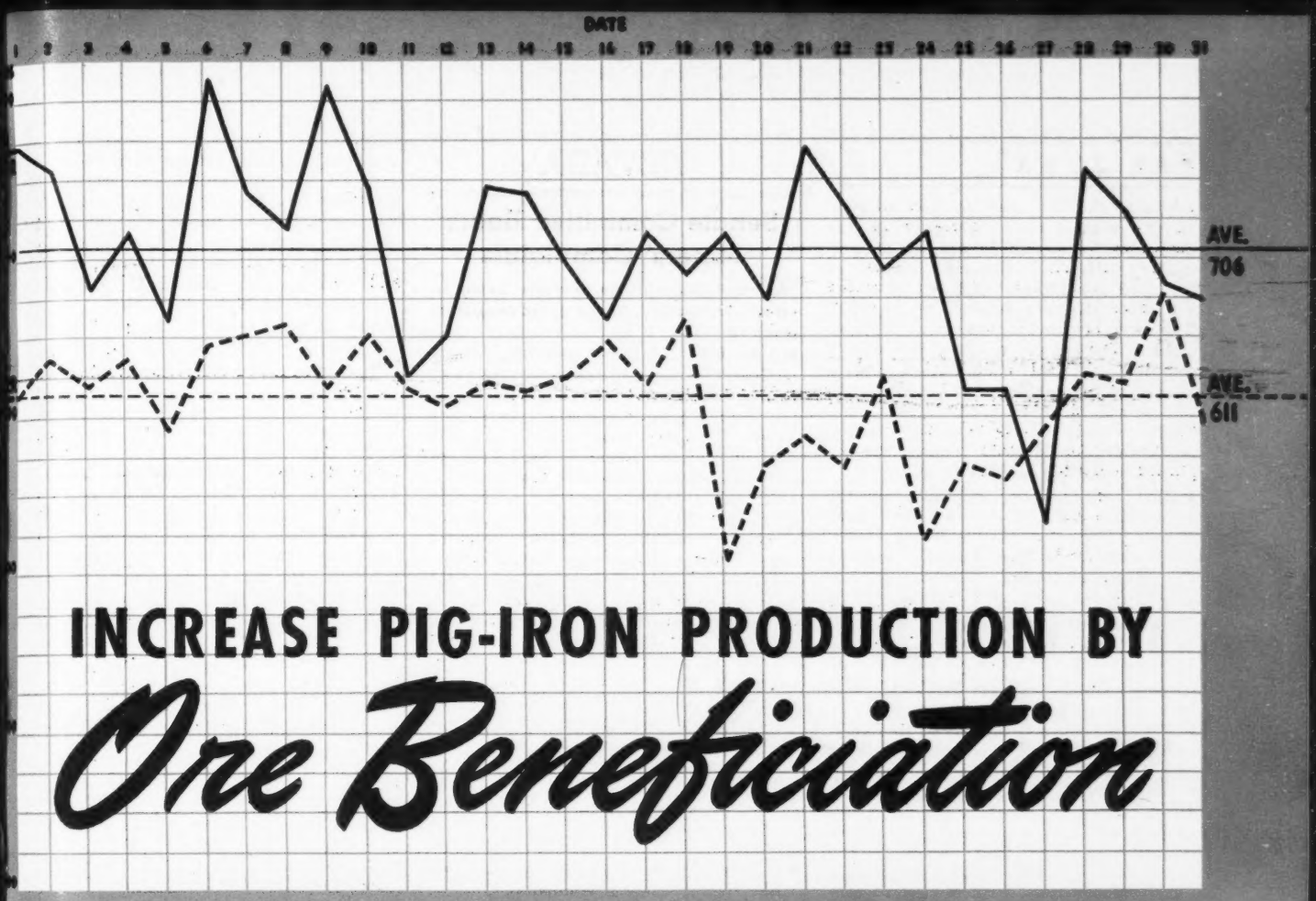
▶The Boggs mine and the Hackberry mine, near Mayer, are being reopened by the Liberty Hills Gold Mines, Ltd., of which R. P. M. Davis, of Hollywood, Calif., is managing director. It is proposed to mill the Hackberry ores in the Golden Turkey mill, near Cordes. Hackberry ores are copper-lead-zinc. Boggs ore is principally copper with subordinate silver and gold.

▶The Arizona Bureau of Mines has made a recent examination of the Eclipse scheelite property, in the Black Canyon district, 4½ miles south of Cleator. The property is owned by Andy Anderson, of Cleator. Eldred D. Wilson made the examination.

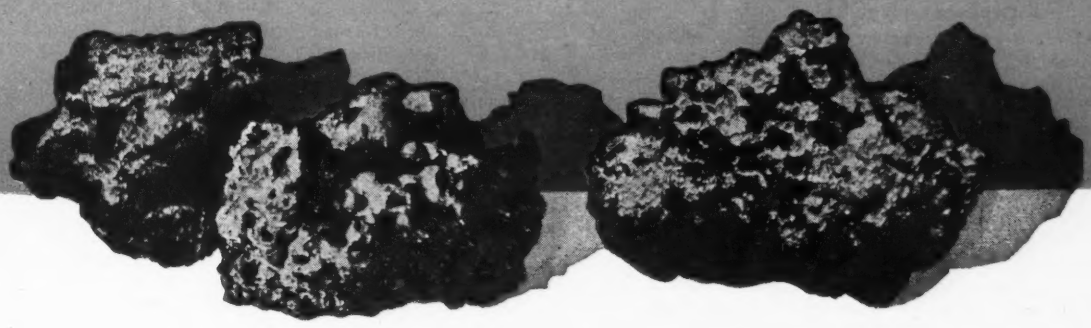
▶Operations at the Springfield mine, in the Crown King area, have been stepped up to two shifts. The property is being reopened with a $20,000 RFC loan. P. R. Helm, of Phoenix, is directing operations. Associated with Mr. Helm are J. P. Sweet and Hugh Nelson, both of Crown King, who are employed on the property.

▶A. N. Bennett, who is in charge of operations at the Gladiator mine, in the Crown King area, was one of those appearing before the Senate Subcommittee on Mining recently in Phoenix. The Gladiator Mining Co. is producing 50 tons daily of gold-copper-lead-zinc ore.

▶The Legislature has passed an act which establishes a state occupational disease fund to provide insurance for all types of employees suffering from any of the defined compensable diseases. Of special concern to the mining industry are silicosis and asbestosis. Questions of the dust diseases will be in the hands of a board of three experts who, by the



INCREASE PIG-IRON PRODUCTION BY *Ore Beneficiation*



THE graph shown above—an actual case history—is a typical example of the increased production obtainable through ore beneficiation. This increase is particularly important in meeting the war's demand for more steel—but equally important to your post-war economics are the efficient performance and lower cost-per-ton resulting from the use of properly beneficiated ores.

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terms of the act, must be licensed physicians with actual experience in the diagnosis, care, and treatment of pulmonary diseases. Similar boards of qualified consultants will be appointed for other diseases covered by the act. The new law holds the last employer liable. The employer may request a complete physical examination and a statement from the prospective employee regarding past employment and health record. Giving false information or any evasion of facts renders the applicant ineligible for the benefits.

▶Zinc ore is being produced at the Arbitration mine, in Powers Gulch, near Miami. The property is being developed with funds from an RFC loan by Carl Elder, of Globe.

▶Ronald Brown and J. H. Macia, of Tombstone, are operating a small mill on ores from the dump of the Tombstone Extension mine. Brown is carrying on development in the mine under an RFC loan.

▶The International Mining & Engineering Co., C. Vincent Riccardi, president and general manager; Joseph Biondo, vice president, and Charles Monmonier, all of Pearce, is reopening the old Leadville mine, near Cortland, in Cochise County. Tests are being made on the dump ores, of which there are approximately 30,000 tons, with a view to constructing a treatment plant.

▶Production of lead ore by the Jefferson Mines Inc., at Nogales, is being increased to six cars a month. The Jefferson company is operating the James E. Bouldin property under lease. J. M. Slater, of Nogales, is president, E. R. Price is general manager.

▶R. W. Thompson, operating the Summit mine, under a lease from the Verde Falls Gold Mining Co., has completed a permanent road to the property and is now reopening the deeper shaft, which has been caved for many years. Though opened originally for the gold ore, the property has produced a considerable amount of copper. R. W. Thompson has been making detailed examinations in the Payson district for over two years and has established residence in Payson.

▶Improved service for testing the applicability of dry magnetic concentration to Arizona ores has been announced by the Arizona Bureau of Mines, which has installed a new magnetic concentrator adapted to strongly magnetic substances. The concentrator is the second supplied by the Stearns Magnetic Manufacturing Co., of Milwaukee, Wis. The first, installed a little over a year ago, is particularly adapted to weakly magnetic substances. The test work is done by E. H. Crabtree, Jr., metallurgist of the Bureau's ore-testing service unit.

▶A lease has been taken by the Manganese Ore Co., M. A. Hanna Co. affiliate, on 820 acres of manganese-bearing land in the Artillery Peak district, owned in fee by the Arizona Manganese Corp. This is in addition to an older lease on adjoining land contracted between the same parties. Both leases run until the year 2007.

NEVADA

Senate Committee Hears Miners' Complaints

Important Goodsprings producer being revived—Manhattan dredge given temporary reprieve

▶More than 100 mine operators, owners, engineers, and company executives attended hearings at Reno on April 12 of the Mining Subcommittee of the Senate Small Business Committee, presided over by Senator James G. Scrugham, of Nevada. Many presented testimony or prepared statements relating to factors that were held to impede production of strategic metals, including current metal price ceilings, excessive taxation, manpower shortage, food rationing for mines, access roads, equipment priorities, ore-producing depots, duplication of effort by federal agencies, and SEC restrictions on public financing of mines. Criticism was directed at the U. S. Geological Survey and Bureau of Mines for failure to make their reports available to each other or to owners of mine properties examined. Senator Scrugham, in searching inquiry, brought out much material for his committee's record from members of the industry in Nevada.

▶Current production of the Getchell Mine, Inc., in eastern Humboldt County, was reported to be 875 tons of sulphide gold ore, yielding 10 to 25 tons of arsenious oxide, and 215 tons of scheelite, the latter treated in the auxiliary tungsten plant within the main cyanide mill structure. Roy A. Hardy, of Reno, consulting engineer for the company, is acting as superintendent in the absence of Fred Wise, who is a first lieutenant of Army engineers at a Virginia training base.

▶Consolidated Coppermines Corp. reported 1942 gross income of $1,789,475.98 from metal sales and $31,418.55 from other sources. Earned surplus was $1,407,161.08 after dividend payments of $714,761.85, and net profit for the year was $702,434 after depletion, amortization of mine develpment, and federal income taxes of $210,000, equal to 44c. per share, against 65c. in 1941. Copper production in 1942, the report stated, exceeded that of any previous year. Cassius I. Cook is manager at Kimberly and Paul J. Sirkegian is general superintendent.

▶Claims in New York Canyon near Austin, Lander County, worked several years ago by the Austin Syndicate, headed by the late Paul Rausch and M. B. Koelliker, of Cleveland, Ohio, have been redeemed from the county, which acquired title for delinquent taxes. O. J. Fundom, Lakewood, Ohio, and C. F. Waag, of Cleveland, have been at the property, which includes the old Maricopa silver mine, preparing to resume work.

▶A substantial volume of lead-zinc-silver ore is being trucked 65 miles to the rail point at Tonopah from the Tybo mine, discovered in 1870 and operated at intervals since then with a 300-ton flotation mill by the Treadwell Yukon Co., Ltd. Taking a lease with the purpose of shipping dump ore, the Hall Brothers Co., Inc., of East Ely, opened new orebodies in upper workings and has been shipping up to 100 tons per day to A.S.&R. smelters at Murray, Utah, and Selby, Calif. Harold C. Anderson is manager of Tybo activities.

▶The Yellow Pine zinc-lead mine, at Goodsprings, Clark County, most productive mine in that formerly active district, has been acquired and is being reopened by the newly organized Coronado Copper & Zinc Co., headed by Philip Wiseman, of Los Angeles. Basil Prescott has been retained as geologist. A Metals Reserve agency is preparing to build a plant at Jean, on the Union Pacific Railroad 5 miles from Goodsprings, to treat carbonate zinc-lead ore of the area.

▶A shipment of 38 flasks of mercury was made recently from the rotary furnace plant of the Harold's Club Mining Co. in the Relief district, southern Pershing County, and production for the past two months has been over three flasks per day. Ore is trucked a mile and a half from the company's Red Bird mine, in which exceptionally high-grade cinnabar has been developed. The Nevada Quicksilver Co. mine, leased by the Harold's Club company and on which the plant is situated, is being developed with good results and mine equipment has been provided on the nearby Good Spot cinnabar claims. The company operates zinc-lead and tungsten properties in other districts. Raymond I. Smith is president and Ervin J. Young managing engineer, with office in Reno; R. R. Weideman is engineer in charge at Relief, and C. A. Coppin, of Lovelock, is mine superintendent.

▶Manhattan Gold Dredging Co., operating the only bucket-line gold dredge in Nevada, has been granted permission by WPB to continue operating until June 30, as a result of intercession by Senator J. G. Scrugham, of Nevada. John L. James is manager at Manhattan. Dredge capacity is around 14,000 cu.yd. per day. The Natomas Co. is part owner and has full management.

Tantalum Discovery In New Mexico

ACCORDING to an official release of the Interior Department, "a private geologist" has discoverd a tantalum-bearing pegmatite in New Mexico from which the Bureau of Mines station at Rolla, Mo., was able to extract "more than three tons of high-grade concentrate" out of a 30-ton shipment in a pilot-plant operation, valued at $3.50 per pound. Neither the name of the geologist nor the site of the discovery was disclosed.

[Tantalite-columbite is found as a rare accessory mineral in pegmatites of the Petaca district of Rio Arriba County, which stretches from Ojo Caliente to Las Tablas. It was also found to a limited extent in the pegmatite of the Harding mine, near Embudo, Taos County, and no doubt occurs in pegmatites scattered through the Sangre de Cristo ranges.—Ed.]

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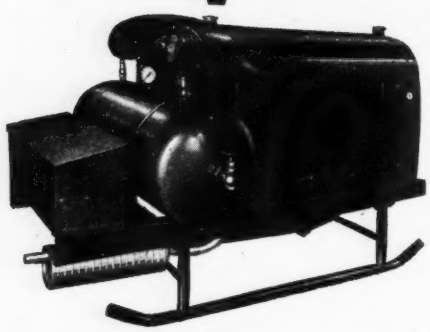

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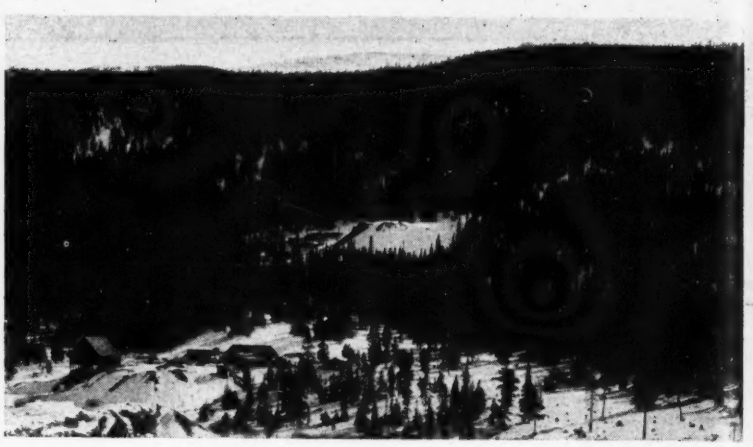


Country Boy mine, near Breckenridge, Colo. This property produced high-grade zinc ore during the first World War, and has been reopened.

COLORADO

New Vanadium Plant At Grand Junction

Appeal court sustains defendant in Shenandoah-Dives labor case — Leadville housing project nearly completed—Salida area has important fluorspar production

▶ George Jump and his three sons, who leased the Oregon Vanadium property, in Gordon Gulch, have completed the unwatering to a depth of 310 ft., and also the retimbering. A 25-ton mill is near the mine. They have completed some developing and stoping on the Hildegard vein in the Oregon group, and started mining on the third level. Both mine and mill are working one shift. Shipments are made every other week. Jump is also working the Good Friday group and the April Fool, which was opened up to the 400 ft. level connecting with a tunnel. A three-machine compressor was installed in 1942, and also a hoist, and at present seven men are working at each of the two properties.

▶ The U. S. Vanadium Corp. is opening up vanadium and uranium ores on Skull Creek in Blue Mountain, western Moffat County. The 400 square mile area is highly mineralized. Although a number of the strategic minerals have been located, very little gold and silver has been found. Zinc and lead have been developed by the Mantel brothers, of Jensen, Utah.

▶ Sturdy & Gabrielli, of Pittsburgh, Pa., are operating the Lead King property, near Marble. Their program includes development of ore and reconditioning of the reduction plant now on the property. This zinc-copper-silver-gold-lead producer is owned by W. Porter Nelson, of Denver, and associates. Mine development is by a 1,000-ft. tunnel and 300-ft. shaft. The 25-ton mill is equipped with jigs and tables.

▶ The lower court decision was affirmed recently by the United States Circuit Court of Appeals in the case of the Wage and Hour Administration Vs. the Shenandoah-Dives Mining Co., of Colorado. The court ruled that all violations had ceased and that there was no reason to believe the firm would violate the act in the future. The complaint alleged violation of the Wage and Hour Act extending over three years. The trial court found that the company entered into a new contract with representatives of the employees about six months after the institution of the action, superseding the contract of which the wage and hour administration complained. The Court of Appeals ruled that an injunction may not be employed to punish past violations, its function being to stop existing violations and to prevent further infractions.

▶ The Red Elephant Mines, Inc., is engaged in driving levels west on the Red Elephant group of mines, worked through the Commodore tunnel, to open up new and additional ground. The mill has been temporarily closed down pending development work.

▶ The Wilson Lead & Zinc Co. is pumping out a winze on the Burleigh tunnel level of the Phillips lode, in the Georgetown area. One drill driving a crosscut north to intersect the Dives-Pelican vein system has been advanced 50 ft. and should open up ground about 300 ft. deeper than the Diamond tunnel level.

▶ During the past twelve months, 248 cars of fluorspar have been shipped from the Salida area. Four mines and three mills are located in the Browns Canyon area, 7 miles northwest of Salida. The American Fluorspar Co., the Colorado Fluorspar Co., and the Kramer Mines, Inc., operate mills. The Chaffee County Fluorspar Co. is considering erection of a mill.

▶ The smaller mines in the Cripple Creek area are short of labor. The following information has recently been released by Merrill E. Shoup, president of the Golden Cycle Corp.: The Elkton Co. produced 8,221 tons of $7.18 ore in 1942, compared with 16,339 tons of ore in 1941, and the gross income dropped from $99,445 to $59,005. The company shaft, operated during the first half of 1942 for the accommodation of split-

check leasers, has been closed, all lessees having left for war industries. The property will reopen after the war; All lessees but one group have left the Leclair Consolidated Mines. These two men are working the Grace Greenwood shaft. The gross value was raised from $33,906 in 1941 to $49,933 in 1942, although the value per ton was only about half in 1941 of what it was in 1942. This was due in part to treatment of more dump rock. The new Gold Dollar Mining Co. suffered a loss of $2,089 in 1942, as most of its tonnage came from dump rock. Total production of mine and dump averaged $6.59 a ton. The main shaft was closed March 1, 1942, due mainly to lack of lessees; Jerry Johnson Gold Mining Co. operated on a small scale, on company account and through sublessees until mid-year, when it was closed.

▶The $1,000,000 Mt. Elbert housing project is now under construction at Leadville and should be ready for occupancy, principally by miners employed by the Climax Molybdenum Co., before June first. This project, being constructed by the National Public Housing Authority, will house 200 families in eight buildings, 300 ft. to 400 ft. long with 16 to 24 units, varying in size from single sleeping rooms to apartments with three bedrooms.

▶Harrison Cobb, who has been producing 500 tons of gold ore monthly from the Ingram Mines, Inc., near Boulder, has started tungsten mining at the Anna C mine, near Nederland, in Sherwood Flats not far from the Wolf Tongue's Quay mine. These properties are developed by 180-ft. deep Anna C shaft, also the Clarsdorf shaft near Rogers Park. Cobb has a sub-lease on the Vasco, a Wolf Tongue property at Tungsten. He has completed the unwatering and retimbering of these properties.

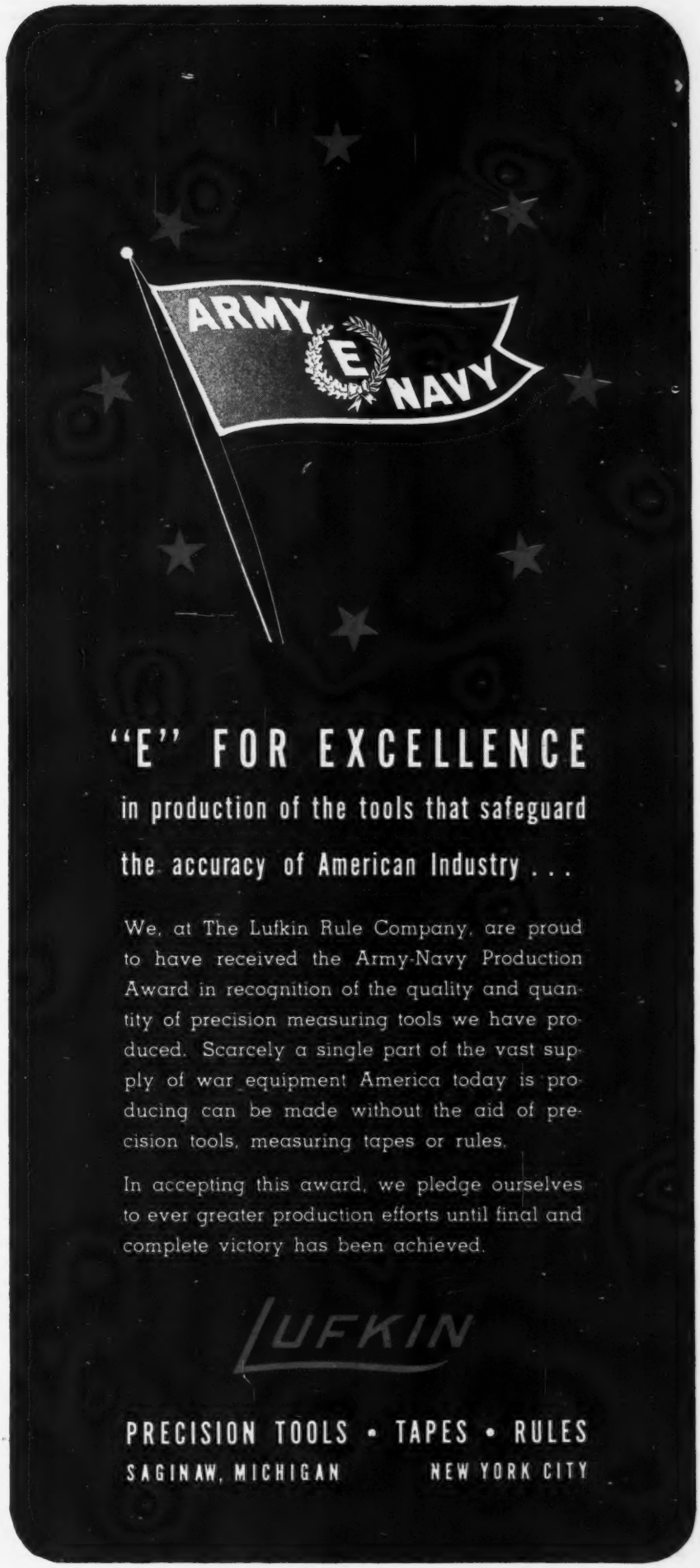
▶Officials of the U. S. Vanadium Corp. have awarded a general contract to the Stearns-Roger Co. of Denver, to construct a vanadium processing plant near Grand Junction. This plant, which is located on the Gunnison River, will be operated for Metals Reserve Co.

▶Frank Stewart, president of the Stewart Mining Co., operating on Italian Mountain, near Gunnison, reports driving into a strongly mineralized zone, showing values in zinc, copper, lead, gold, and silver. This property has been intermittently mined for nearly 15 years.

▶Clarence Martin, manager of the Martinette Mining Co., in the Montezuma district, has opened up the Superior mine and has two shifts operating. Hugh Chisholm, in charge of the mine work, has completed an overhead tram connecting the mine with the county road at the foot of the hill. The mine has a good showing of ore.

▶President Druesdow of Hercules Mining Co. is preparing for operations at the property, near Montezuma. This mine is equipped with a 410-ft. compressor, track, air pipe, and necessary surface buildings. Druesdow's Marlin mine, north of the Hercules, has installed a new power plant in the mill, in addition to a new table.

▶J. B. Furstenburg is now in posses-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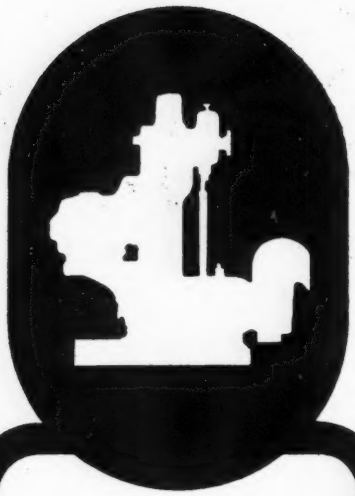

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sion of the Clear Creek end of the Argo tunnel property and buildings. A treasurer's deed to the property was issued early in March. George Collins, Denver mining engineer, who has been operating the property for some time, appeared before Judge Davis in Littleton with a request for an injunction against issuance of the treasurer's deed. This was denied.

▶ Carl Peterson, superintendent of the Summit County Lead Zinc Co., has four men working on the Ohio level of the Old Pennsylvania mine, at Argentine. Samples taken from the new find show 200 oz. of silver and are high in lead. This mine was an early-day producer. The Plymouth 150-ton mill will be open for custom milling this summer. Mr. Peterson will be in charge of all milling operations. This 150-ton milling plant could handle all ore from this section, as well as ore from the Country Boy mine, at Breckenridge, and the Big Four mine, operated and owned by Walter McDaniel.

▶ Matt Kesserick and associates, having opened up ore near the Rawley mine, in the Bonanza district, are shipping lead-zinc ore while carrying on an extensive development program. The 50,000-ton dump of low-grade zinc-lead ore is being shipped to the Golden Cycle mill, at Colorado Springs.

▶ George Goodman, operating the Bullion mine, near Montezuma, is driving a crosscut to the Aorta vein, which showed rich ore in the old surface workings. This property has been a shipper of high-grade ore direct to the smelter.

▶ Buster Johnson, operating the St. Louis mine, in the Bonanza district, is shipping lead-zinc ore to the Midvale, Utah, smelter. He is also unwatering the lower workings.

▶ The main drift on the Fisherman mine, in the Montezuma district, is being retimbered by Mills and Dyer, of Denver. This drift heads southwest into Bear Mountain, and runs through considerable loose ground. Alex Ryan is in charge of the work. Emmet Brophy and two assistants, using single jacks, extracted $5,000 worth of ore in 90 days in 1942.

▶ Costello and Graves, lessees on the Rawley mine, in the Bonanza district, have opened a good body of zinc-lead ore. While timbering up caves, they are removing zinc ore left from early-day operations, because of zinc penalties. Matt Hayes is sinking a winze on the Rawley No. 3 mine, being operated by Oscar Fisher, of Denver. The present lessees expect to remove a large body of zinc ore left by former operators.

▶ During a temporary shutdown, Alexander and Wells cut a nice orebody on the main tunnel level of the Florado mine. Manager F. R. Wolfe opened up ore in the bottom of a 100-ft. winze completed last fall. This St. John's property, in the Montezuma district, now owned by the Florado company, has a large production record of silver-lead ore.

UTAH

Vanadium Treatment Plant Begins Operation

Utah Copper wage increase averts walkout—Vanadium ore discovered at Mercur Dome—Garfield smelter sets production record

▶ Operation of the newly completed plant of the United States Vanadium Corp. in Salt Lake City began on April 16. The mill, constructed at a cost of $450,000, will be operated for Metals Reserve Co. Treatment started of a stockpile accumulated from shipments by a number of tungsten mines in the Western states and Canada. Fifty-five employees operate the plant under the direction of David D. Baker, superintendent.

▶ On April 7 employees of the Utah Copper Co. mine and mills at Bingham, Garfield, and Arthur were granted a 25c. per day wage increase, retroactive to Nov. 1, 1942. This action, taken at the request of copper company officials, headed off a threatened walkout, of 1,300 workers in the Magna and Arthur mills.

▶ The incline shaft of the Mercur Dome Mining Co., near Mercur, has cut two blanket beds of vanadiferous shale just above its objective, the Madison limestone. The deposit is believed to offer a source for obtaining considerable quantities of vanadium.

▶ American Smelting and Refining Co. officials announced that the Garfield plant has set a new world record for production and has reduced absenteeism to 3.7 percent. W. J. O'Connor, Utah department manager, announced that because of the excellent work of the labor-management production committee, the plant is getting the best results since the outbreak of the war. Workers at the plant were stirred to new production levels by the committee's announcement that man-hours lost through absenteeism during a month were sufficient to have produced enough copper for a battleship.

▶ The annual report of the Chief Consolidated Mining Co. for 1942 shows a consolidated net income to surplus of $38,903, compared with a net loss of $54,149 for 1941.

▶ Encouraging progress during 1942 in the properties of the North Lilly Mining Co. is reported by J. O. Elton, president. Development operations in the joint project undertaken with the Tintic Standard Mining Co. and in the Tintic Bullion lease yielded most of the production of copper, lead, and zinc.

▶ Production of the Ohio Copper Co. of Utah, mill at Lark, treating tailings, amounted in 1942 to $283,831 in concentrate. Gross income amounted to $267,967 and net operating profit, before depletion and depreciation, to $51,565, a $10,000 increase over the figures for 1941.

▶ Metals Reserve Co. has leased the Gold Hill arsenic mine, at Gold Hill, Utah.

from the United States Smelting, Refining & Mining Co., which is operating the mine for the federal government and treating much of the ore at the Midvale smelter. J. B. Knaebel, formerly in charge of U.S.S.R.&M. Co. zinc operations at Bayard, N. M., is superintendent.

▶ Development work at the Lenora Mining & Development Co. property, near Milford, has encountered a zinc-lead ore zone, reports John Matson, of Salt Lake City, president and manager.

▶ Two more Utah operations have received RFC loans. The first loan has been made to Jesse R. Villars, of Milford, for unwatering and working the 700 and the 800 levels of the Quad mine, in the San Francisco district. The second was an additional development loan of $20,000 to the New Cashin Mines, Inc., of Heber City, to develop the Cashin copper mine, near Paradox, just across the Utah state line in Colorado.

▶ Fred A. Brinker, engineer, announces a new mill for treatment of vanadium ore, by the Blanding Mines Co., at Blanding. Brinker began operations at this mill about the middle of March, and states that it will process ore from mines leased by the company in the Cottonwood district, 14 miles southwest of Blanding. Concentrates will be trucked to Montrose and shipped from there via. rail.

AS&R Buys Magdalena Zinc Property

THE American Smelting & Refining Co. has acquired the Ozark mine and mill, in the Magdalena Range near Magdalena, N. M., from the Ozark Smelting & Mining Co., a Sherwin-Williams affiliate. This is a lead-zinc property, principally the latter, carrying some precious metals, with chalcopyrite in the contact zone near a tertiary monzonite stock. Most of the ore consists of mesothermal replacements in the Lake Valley limestone (Mississippian), and to a lesser extent in the Magdalena formation (Pennsylvania limestones and shales). The principal host rock is a member in the Lake Valley series known as the "Silver Pipe." Much of the ore in the upper levels is oxidized, and has been shipped to the Coffeyville (Kan.) plant of Ozark Smelting & Mining Co. for conversion into zinc pigments.

Production of Silver Declined in February

ACCORDING to the U. S. Bureau of Mines, domestic production of silver declined during the month of February, despite a 37 percent increase in Colorado production due to weather conditions in January preventing shipments of concentrates from reaching the smelters until February. The February production was 3,515,130 fine oz., a decline of 6.5 percent from January. The decline was principally due to shutting down of gold and silver mines not producing enough base metals to receive effective priority assistance from the War Production Board.

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ALASKA

Government Prospecting for Several Minerals

Yukon Consolidated and McRae dredges will operate this year—Alaskan wages are frozen——Legislature aroused over ban on prospecting along Alcan route

▶ Secretary Ickes states that through Alaska's 586,000 square miles are many untapped and unexplored mineral deposits which contain virtually all the strategic, critical, and essential war metals, and that he is sending exploring crews from the Interior Department in a quest for these war minerals. According to Mr. Ickes, the investigation of the Lost River tin mine, on Seward Peninsula, indicates a substantial tonnage of low-grade tin ore. At the junction of the Yukon and Tanana rivers in the Manley Hot Springs area the ground is being sampled for tin ore and a search for the same mineral is being made in the old tin placer ground in the Buck Creek-Potato Mountain area, at Cape Mountain, near Tin City.

▶ Considerable commercial-grade mercury ore has been found by crews which sank a shaft near Sleitmut, on the Koskokwim River. This deposit, it is said, will be opened by private enterprise. On Prince of Wales Island, in southeastern Alaska, the government is exploring for iron and copper, tungsten is being sought near Hyder, and a search is being made for nickel on Yakobi Island and for chromite on the Kenai Peninsula. Ore samples are sent to the Bureau of Mines laboratories at Rolla, Mo., and Reno, Nev.

▶ Alaska Juneau Gold Mining Co. made a net profit of $237,626 in 1942, according to P. R. Bradley, president. This compares with $730,000 in 1941. The company was permitted to operate with a crew of 350 men after the WPB had ordered the shutdown of nonessential operations.

▶ Curtailed by a shortage of labor and difficulties in obtaining machinery, the Yukon Consolidated Gold Corp. expects to continue its gold-dredging operations in the Klondike this season at 50 percent of capacity. C. E. McLeod, secretary, says five of the company's ten big dredges will be used, with a personnel of 230 men instead of the customary 800.

▶ E. N. Patty, general manager for the A. D. McRae interests in Alaska and the Yukon, reports that the gold dredge on Clear Creek will operate during 1943. He says the operation is chiefly to give employment to older men in the area who are beyond military age. A full crew will be employed in continuous day and night operations.

▶ Michael J. Haas, territorial representative in Juneau of the Wage and Hour Division of the WLB, says increases in wages and salaries in Alaska will be approved only in exceptional cases. "The board will examine carefully each claim before approving any increase," he says, "and will be guided by the following four reasons: First, maladjustment of wages where less than 15 percent increase has occurred since Jan. 1, 1941. Second, correction of inequalities. Third, substandards of living. Fourth, effective prosecution of the war."

▶ One of the last acts of the Territorial Legislature was passage of a memorial asking Congress to authorize prospecting, settlement, and development in the eight million-acre twenty-mile strip on each side of the Alaska highway. If the withdrawal is permitted to stand, an important segment of Alaska's potential mining area will be inaccessible.

WASHINGTON

Make Power Survey of Pend Oreille River

Columbia section A.I.M.E. elects officers—Dolomite mining rejuvenates Northport—Blue Ridge mine will expand production

▶ The Columbia section of the A.I.M.E., at its last meeting in Spokane, elected R. D. Leisk, manager of Sunshine Mining Co., as chairman; Angus Bethune, of Kellogg, secretary; P. J. Shenon, of Spokane, vice chairman, and Walt Melrose, assistant secretary. The section is adopting a new plan, and instead of holding all meetings in Spokane, as it has done for 40 years, will hereafter hold half its meetings in Spokane and the other half in the Coeur d'Alenes, because of the large membership there. At the last meeting Mr. Shenon reported on conditions in the East and of the need for quartz crystals, book mica, and other strategic minerals.

▶ Government agencies, anxious to provide power for the Metaline district, and 3,000,000 acre-feet additional water storage for Grand Coulee and Bonneville dams in the Columbia, have a large corps of army engineers, with headquarters established at Newport, who are studying the possibility of a dam or a series of dams on the Pend Oreille River. Fred G. Widen is civilian field engineer in charge. Lieut. Col. Ralph A. Tudor, of Portland, chief of the district Army engineers, is cooperating, and Lieut. H. R. Staats is in charge of charting and photography. Several dam sites are under consideration, among them being Z Canyon, below Metaline Falls; Box Canyon, just above that town; another at Albani Falls, and two others near Pend Oreille Lake, in Idaho.

▶ Pat Hetherton, executive officer of the Washington State Planning Council, has announced that a drive is to be made in Washington and Oregon to prepare for the production of pig iron and alumina. The purpose is to make the Pacific Northwest self-sufficient in production of war tools and airplane parts. This would make easily accessible aluminum plants in Tacoma, Spokane, Vancouver, and Longview. Iron ore from Okanogan County has been sent to Cascade Locks, on the lower Columbia, near Bonneville Dam, for experiments to determine whether an

electrolytic furnace could produce sponge iron.

▶Since the "Day" smelter, at Northport, was closed and dismantled, years ago, many dwellings have stood vacant in that town. The government is now asking the owners to remodel and make habitable 50 of these residences to accommodate men who will be working at the dolomite mine, four miles from that town. It is expected 200 men will be employed. These quarries will furnish dolomite for the magnesium plant in Spokane.

▶Howard I. Young, president of Metaline Mining & Leasing Co., reports gross operating profits for that corporation in 1942 at $66,392. The company sustained a net loss in the year of $13,221, compared with a loss in 1941 of $60,426 after all charges. The company was indebted to American Zinc, Lead & Smelting Co. to the amount of $615,752 on Dec. 31, 1942. "Net financial results of Metaline Mining & Leasing Co.'s operations thus far have been quite disappointing," the report states. "Results from development in progress below the tunnel level are inconclusive, and prospects of finding new orebodies there seem less hopeful now than a year ago."

▶Several faces of ore have been opened in the Blue Ridge mine, in Stevens County, now operated by Sierra Zinc Co., says E. W. Jamison, president. These orebodies he expects will enable the company to more than double production this year. The ore warrants a mill of 75 or 100 tons' capacity, he says. Fifteen men are employed.

▶K. F. Pinnell has taken an option on claims in the Skookum Creek district, 8 miles east of Usk. He has put in a compressor with which to drive a 100-ft. tunnel. Antimony is part of the ore.

▶Charles Delk, of Yakima, and associates, have acquired the old United Copper mine, northeast of Chewelah, paying off a $4,000 bank indebtedness. The No. 2 tunnel, 4,200 ft. long, has been reopened. This property produced $1,420,825 up to 1918.

▶Frank Lilly, of Spokane, secretary of the Prospectors' and Mine Owners' Association, has asked the governors of the four Pacific Northwest states to join in calling a conference of those and other state officials to consider what can be done to bring about increased production of the metals essential to winning the war. He says the reason small mines are not operating is because SEC regulations and state blue-sky laws make it almost impossible to finance the development of such properties.

▶General Electric Co. has offered to sell its Germania tungsten mine; in southwestern Stevens County, for $50,000. In the past the property has been a heavy producer.

▶Sullivan Machinery Co. has started prospecting of the Double Eagle mine 13 miles southwest of Valley, to determine the extent and importance of the magnesite deposits on that property. The owners are Minneapolis and Spokane men who have about 300 acres in that holding. It is an old property which was once mined for silver and lead.

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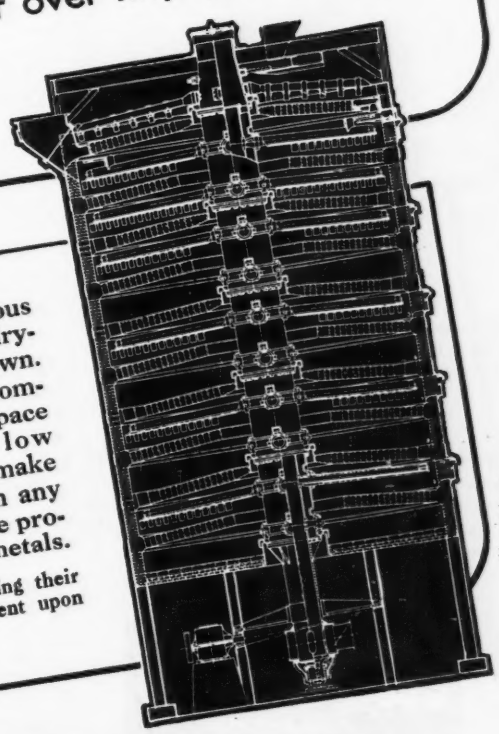

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Bulletin 206 briefly outlining their use and design will be sent upon request.

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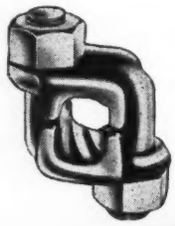

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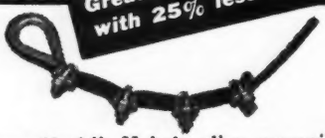

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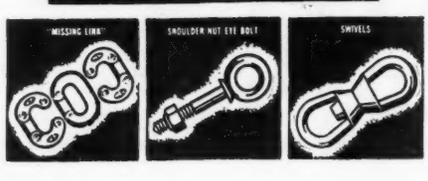

OREGON

Survey Geologist Reports on Black Beach Sands

Work to start soon on metallurgical laboratory—New mill at Bourne mine—Report issued on Lake Creek manganese deposits

▶ Allen B. Griggs, geologist with the U. S. Geological Survey, after spending parts of 1941 and 1942 studying the beach sands in Coos County, is now preparing a report to his department. These sands will be used to feed a large concentrator of probably 2,000 tons' daily capacity being built by Krome Corp., of Marshfield. This plant will handle sands produced by the Krome Corp. and by Humphreys Gold Corp. The ground, mined 80 years ago for gold and platinum, will now produce chrome and other war minerals. "This large plant, to be finished this summer, will handle beach sands over gravity tables, after which they will be given an electric separation, to be followed by a final separation which will produce the chrome products wanted by munitions makers," Mr. Griggs says. "This plant probably will also produce zircon and other war minerals. In these heavy mineralized sands we have found not only chromite and zircon but also magnetite, ilmenite, garnet, and small amounts of gold and platinum."

▶ Work is expected to start at once in the transfromation of the old college campus at Albany into the new $500,000 electrometallurgical laboratory for the U. S. Bureau of Mines. It is said the Bureau is ready to release the necessary funds for this construction. Power for the enterprise will be provided by the Bonneville administration.

▶ W. E. Marrion, of Coquille, expects to continue shipments this season of manganese ore which he has produced at the McAdams property, near the Coos-Curry county line, east of Langlois. The ore is hauled to the Metals Reserve ore-purchasing depot at Coquille.

▶ The Oregon Department of Geology and Mineral Industries has issued a strategic and critical map of minerals in the State for the use of prospectors. It also has maps of surveyed quadrangles and other mining districts.

▶ A. M. Dixon, WPB, and Norman Wagner, of the Oregon Department of Geology and Mineral Industries, made recent inspections of the Buckeye mine, near North Powder, the Koehler antimony mine, east of Baker, and of the Iron Dyke copper mine, at Homestead. At the Iron Dyke drifting and diamond drilling are in progress.

▶ Ellis Mining Co. is operating a lease and building a mill at the Bourne mine, in the Sumpter district.

▶ The Tyrrell manganese deposits, in the Lake Creek district, are treated in paper No. 10 by the State Department of Geology and Mineral Industries. It is prepared by Wallace D. Lowry, junior geologist. "Manganese occurs mainly as fillings in openings in agglomerate, just above the contact with an underlying fine tuff," he says. "The manganese oxides occur as psilomelane, pyrolusite, manganite, and wad." This district is 15 miles east of Medford. The paper includes a geological map of the district and a plat of the Tyrrell mine.

IDAHO

Sunshine Announces New Silver Application

Bunker Hill report shows good condition—Miners will have extra food and gasoline—Day interests progressing in Beaver Creek development

▶ Bunker Hill & Sullivan M. & C. Co.'s annual report for 1942 completes 55 years of mining activity by that company in the Coeur d'Alene district. This record is equalled by very few mining companies in the United States, especially where operations have been confined practically to one mine. The company is owned by 3,469 common stockholders, of whom 1,898, or about 54 percent, are residents of the Pacific Northwest. Bunker Hill mine produces 1,400 to 1,500 tons of ore per day. The report gives the ore reserves in sight and blocked out ready for mining as 2,839,620 tons, compared with 2,730,398 tons at the close of 1941, an increase of 109,222 tons after deducting a year's heavy production. Net income for the current year after provision for all federal taxes amounted to $1,300,327.17, compared with $1,568,696.70 for 1941, and though the production of the Bunker Hill mine was increased and more favorable metal prices existed during 1942, profits from operations were $626,920.01 less than for the previous year. The reduction in net income was due chiefly to rising labor costs and higher federal income tax rates. Sales of metal and byproducts produced by the Bunker Hill smelter for 1942 are given as follows: 67,681 tons of lead; 2,123 tons of antimony; 2,879 tons of copper in byproducts; 10,310,947 oz. of silver, and 2,398 oz. of gold. Production of the Bunker Hill mine for the year is given as 29,029 tons of lead; 1,592,945 oz. of silver, and 13,610 tons of zinc.

▶ The Eastern Idaho Mining Association is advised by Harry W. Marsh, secretary, that, through the efforts of the association, gasoline has been released by the government to the small mines. Also, the meat, vegetable, and food regulations have been modified to take care of all the mines; also mine boarding houses and miner's families.

▶ To insure the flow of vitally needed war metals and lumber from the mines and forests of Idaho, the War Manpower Commission has announced new procedures and regulations for compliance with its non-ferrous metals and lumber employment stabilization plan. The three major points of the new program provide for rigid enforcement of the stabilization plan at the mines, mills, and smelters, and at logging and lumber

mills; measures to prevent the hiring of metal and lumber workers in other areas, and provisions for the return of those who already have left the industries; also, selective service-action to assure the deferment of these workers.

▶Sunshine Mining Co., through its president, R. M. Hardy, addressing the company stockholders at the annual meeting in Yakima, Wash., announced the sensational discovery by the company's research chemists of converting salt water to fresh water with the aid of silver, which is the company's principal product from the Sunshine mine, in the Coeur d'Alenes. Several years ago the company established what is known as the Rare Metals Institute, a chemical laboratory devoted to the investigation of possible new uses for silver. Research chemists employed by the company in this work have made many remarkable discoveries about silver. In 1842 the company announced "progress in the use of silver to produce self-sterilizing plastic surfaces and lacquers. A timely development along this line is a method of impregnating bandages and wound dressings with these highly sterile preparations. The American volunteer unit in China has reported satisfactory results from the use of the carbon silver pellet developed by Rare Metals Institute for sterilizing drinking water." The method of converting sea water into palatable drinking water through the use of a silver chemical formula, as now announced by the Rare Metals Institute, was discovered by Dr. Alexander O. Goetz, who is in charge of the experimental work for the Sunshine company.

▶Opening of the Beaver Creek district, north of Wallace, by the Day interests is one of the largest mine development enterprises undertaken in the Coeur d'Alene district in recent years. Small mining companies have spent fortunes in the district in years past, but the ores developed were principally zinc, and were unprofitable at the time. The war demand for zinc has improved the picture, and during the past two years the Day interests have absorbed all of the smaller companies into one organization, the Monitor Mining Co., and preparations are now being made for a large-scale operation. Diamond drilling operations by the U. S. Bureau of Mines during the last year have revealed the existence of two and possibly three unexplored zinc-lead veins in the Parrott and Silver Tip claims of the Monitor company in the Beaver Creek district, according to the annual report of the company. The Monitor company recently purchased the interests of the Portland Mining Co. in the same district, making the Monitor the largest mining company in the Beaver Creek section of the Coeur d'Alene district, with holdings of 97 mining claims, all of which comprise one continuous group and which contain several known zinc-lead veins besides the new discoveries made by diamond-drill operations. Two of these veins are now in production on a small scale.

▶Hecla Mining Co.'s annual report of operations during 1942 shows that 920,650 tons of ore were mined during the year from the Hecla property, re-

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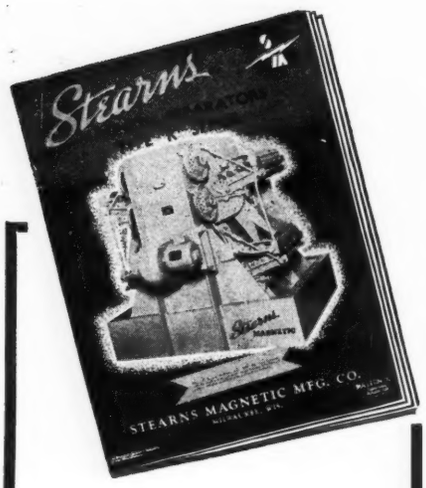

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sulting in a net income of $1,446,693.50, after depreciation, depletion, and provisions for taxes. Federal, state, and county taxes totaled $899,339.24. The company received dividends during the year in the amount of $250,000 from the Sullivan Mining Co. and $37,935 from the Polaris Mining Co. Dividends paid by Hecla during the year amounted to $1,000,000, bringing the total dividend record for the mine to $25,905,000 up to Dec. 31, 1942. "Full capacity operations were maintained at the Hecla for the first eight months of 1942," said L. E. Hanley, president and general manager, "after which, due to a shortage of labor, production was cut about 15 percent. This reduction virtually wiped out premium payments for our lead, but we are still receiving the premium on zinc. Ore reserves in the Hecla mine at the end of the year are estimated at 145,522 tons. Development work and an increase in width in some of our stopes resulted in gaining some tonnage over our estimate of last year. This, together with the decreased output per month, has extended the life of the mine operations. Beginning about May 1, 1943, the declining tonnage from the mine will be supplemented in the mill with ore from the Silver Cable lease and from the Osburn tailings project.

▶Preliminary figures released by the Clayton Silver Mines Corp. of Clayton, in eastern Idaho, in advance of its annual report, show a healthy increase in tonnage and value of the different products in recent months. Total smelter receipts for ore shipped in 1942 totaled $276,429, compared with $219,070 in 1941. Lead production amounted to 3,014,384 lb., compared with 2,489,918 lb. in 1941. The company installed a new zinc flotation unit late in the year and the zinc tonnage shipped totaled 1,217,405 lb., compared with none during previous years. Silver production totaled 138,539 oz., against 127,951 oz. the previous year.

▶The Callahan Zinc-Lead Co. reports that zinc production from its Duquesne mine at Patagonia, Ariz., was increased during 1942, and copper and lead production was also greater than in 1941. The company's mill on the Duquesne property has 100 tons' daily capacity. The company's Deadwood mine in Valley County, Idaho, is now producing zinc-lead concentrates. Its Akron mine, in Colorado, will be in production of zinc-lead silver ore this year. In 1942 the company purchased the AWC zinc property near Joplin, Mo., that has since been put into operation by the St. Joseph Lead Co.

▶According to a report from New York, Federal Mining & Smelting Co.'s operating profits for the first three months of 1943 are estimated at $351.881, compared with $659.251 for the corresponding period in 1942, a decrease of $307,370. Principal cause of the shortage is said to be the curtailment of operations at the company's Morning mine because of lack of manpower. Another contributing factor was the loss by fire of the company's Gordon mill in the Tri-State.

MONTANA

Government Examines Extensive Clay Deposit

Large chromite concentrator ready for operation—To build mill for Carbonate mine—Scheelite recovered in dredging operation

▶Mining activity in Montana has dropped to what is probably an all-time low. By far the greater number of Montana's mining operations, prior to the government's order restricting the mining of gold and silver ores, were producers of gold and silver. Outside of the Butte area there are probably 20 active mines, compared to 80 or more that were operating a year ago. Many of the present operations are new ones that have started since the gold mine closing order became effective. Several of the former operators of gold mines are swinging to the production of minerals needed in the war industries, utilizing their old mining staffs and equipment, and a few new operators have entered the field. The most important new mineral product from Montana is chromite from the extensive deposits of the Stillwater Complex in Stillwater County. Chromite production will be increased materially this year with the completion of the new 3,000-ton concentrator being built by the Anaconda Copper Mining Co. This concentrator was scheduled to go into operation by May 1. The chromite ore will come from the newly developed Mouat mine. Other new operations in the State are producing talc and graphite from Beaverhead County, antimony ore from Sanders County, and chromite from Madison County. In addition there are a number of new producers of lead, zinc, and manganese ores. The RFC is aiding the miners with preliminary development loans and has done much to assist the recovery of the industry from the effects of the gold-closing order.

▶Swansea Mines, Inc., a Washington corporation, plans to build a mill for the treatment of lead ore from the Carbonate mine, in Lewis and Clark County, 18 miles north of Lincoln. C. L. Hewitt, of Helena, is president of Swansea Mines, Inc.

▶H. & H. Mining Co. is recovering scheelite from the gravels of Henderson Gulch, near Hall. The company is dredging the gravels, using a new 3-cu.ft. Yuba bucket-line dredge. Scheelite and placer gold are recovered in the operation. The scheelite concentrate is sold to Metals Reserve Co. E. H. Noon is superintendent of the operation. The scheelite in the gravel is derived from a large body of contact-metamorphic rock cut by the canyon of Henderson Creek. Grains of scheelite occur in quartz seams in this rock and are liberated by erosion, eventually becoming concentrated in the stream gravel.

▶E. R. Tuttle and associates shipped ore containing 750 tons of metallic manganese from the Nettie mine, west of Butte, in the last six months of 1942.

Production to date for 1943 has been at approximately the same rate as the 1942 production. The Nettie mine, once a well-known silver mine, is being worked under a lease from Anaconda. The current operation is conducted through a new 600-ft. adit drift in the vein. Average production is 150 tons of ore per week, containing not less than 15 percent manganese. Six men are engaged in the mining operation, divided into two shifts per day. The ore is trucked to the Metals Reserve Co.'s stockpile in Butte. Compressed air for drilling purposes is supplied by a 220-cu.ft. capacity portable air compressor. The tramming power unit is one well-trained gray horse, an unusual sight in the Butte district these days.

▶A large deposit of high-alumina clay near Lewistown, in Fergus County, has recently been examined by engineers of the U. S. Bureau of Mines. The Bureau is interested in the possibility of producing aluminum from this clay, and plans to drill and sample the deposit to determine the tonnage and alumina content. Whether or not aluminum can be economically extracted from the clay has not been determined. Many experimental processes for the extraction of aluminum from various types of clays have been tried, but to date no commercial plant is producing aluminum from clay in the United States. The U. S. Bureau of Mines claims to have perfected an extraction process that can be used successfully on clays of the Lewistown type, in a pilot plant at Boulder City, Nev.

▶As stated in the April issue of *E.&M.J.*, the Domestic Manganese & Development Co., of Butte, is preparing to build a 400-ton capacity manganese ore concentrator at Butte. Clearance for immediate construction of the mill was granted in March by WPB. It is reported that the Reconstruction Finance Corp. will supply the money required. The mill will handle custom ore from several small mines in the Butte and Philipsburg areas, including ore from the Tzarena mine, operated by John Cole, of the Domestic Manganese Development Co. It is estimated that the capacity of the mill will be adequate to treat all manganese carbonate ore produced in this area with the exception of production from the Emma mine, at Butte. The Emma, largest producer of manganese ore in Montana, will continue to ship its ore to the concentrator and nodulizing plant at Anaconda. Concentrates from the new mill will be treated in a roasting and nodulizing plant in Butte, owned and operated by the DM&D Co.

WPB Requires Blending of Chromium Ores

TO CONSERVE high-grade chrome ores and utilize lower grades, Order M-18-a of the War Production Board, effective April 22, requires ferrochrome producers to blend high-grade chrome ores with lower grades so that the chrome-iron ratio will not exceed 2.6 to 1. Natural ores low enough in grade to meet these specifications will not have to be blended.

It's Not the Cost *Or* the Upkeep— *With Amsco-Nagle Pumps* . . . . . .

The expense of upkeep is more important than the original cost of a pump, as any mine operator knows. This is especially true now, when replacement parts are a drain on the nation's stock pile of metals, and manpower to install replacements is often lacking.

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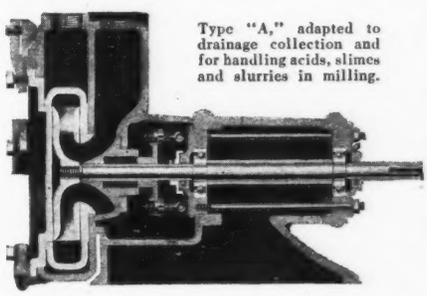
Consider, for example, the basic soundness of having the water-end and the base or bearing



Type "A," adapted to drainage collection and for handling acids, slimes and slurries in milling.

stand two separate units instead of having the pump shell bolted to the base. Users tell us the advantage of ready removal of the water-end unit is a real one, particularly in the time saved by not having to dismantle the entire pump.

Likewise observe the accessibility of the impeller. Note that the side plate on the Amsco-Nagle pump can be quickly removed by merely loosening three to five clamp bolts, depending on pump size. Adjustment of the stuffing box gland is a very simple procedure. No special tools are needed.

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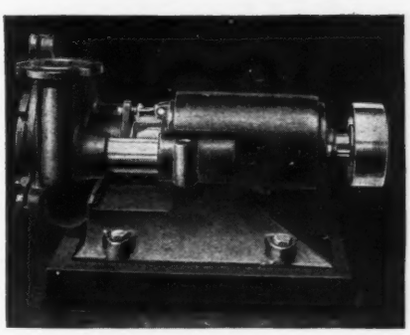
The complete story of this unusual line of pumps is given in Bulletin 940, sent on request. Vertical shaft pumps, with features typical of all Amsco-Nagle pumps, are also described.



Type "T," for mining and milling operations under flooded intake conditions or where priming is no obstacle. Note the readily removed water-end.

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Cleaning outcrops after bulldozer in prospecting for Arkansas quicksilver at mines of Humphreys Gold Corp.

ARKANSAS

Batesville Area May Use Beneficiation

Hurricane mine has ore in second shaft —Survey party studying quicksilver area —Diamond production prevented by WPB

▶ Since Metals Reserve discontinued its market for low-grade wad ore March 31, manganese mining in the Batesville-Cushman field has shown a big slump. This is because most of the ore mined up until that date has been low-grade wad. The production of high-grade ore, however, is showing a good increase since Metal Reserve removed the penalty for phosphorus, and will continue to increase. It is probable that the decrease in the production of low-grade wad will be only temporary. Laboratory tests to beneficiate this ore show that it can be raised several points. Marshall McGee and C. S. Little, operating the Gray Hill mine, have had tests made on cleaning, screening, and heating that raise the grade as much as 10 points. Laboratory tests have also been made on calcining processes for low-grade carbonates, to raise the manganese content per ton. Some of these tests show that the grade can be raised to as much as 40 percent. Low-grade wad ore runs from 18 to 35 percent manganese content. Carbonates run from 18 percent well up into the forties. However, the big bulk of both of these runs into the lower figures.

▶ One new operation was started in the field late in March. C. V. Johnson, quarryman, of Little Rock, associated with W. B. Harold, of Texas, leased the Polk Southard property from the Southern Mining & Manganese Co., and started operations with heavy equipment. They are now using a big power shovel and will install a bulldozer for stripping purposes. They will retain their lump ore and sell their mill crude to washing plants.

▶ The production of high-grade ore by the Walter H. Denison Manganese & Contracting Co., of Cushman, is gradually increasing, and in a few months the company expects a production of around 100 tons a week or more. It is sinking new shafts on its properties in the Pfeiffer area, and is also operating in Arizona, about 20 miles south of Flagstaff, and will move a force of Arkansas miners to that point this spring.

▶ The Southern Mining & Manganese Co., headed by Berry Fitzgerald and Herman Miller, of Batesville, who operate the Southern Hill mine, near Cushman, and who have been operating a small concentrating plant on the Bayou, is planning expansion of the plant which has been an experimental pilot unit. The company expects to add 20 jig cells and other equipment. The crude ore cleaned and concentrated in this plant comes from the Southern Hill mine.

▶ Production in the north Arkansas zinc and lead field during March and early April was light. Most of the work in the field for the last two months has been development and installation of mining and mill equipment.

▶ The new Rush Creek Mining Co. which has the White Eagle, Lonnie Boy, and LaRue, all in the Rush Creek district, has applied for a $25,000 government loan to start operations. It has sunk a shaft on the White Eagle and encountered a run of jack. John Dirst and W. J. Cushing, of Yellville, are in charge of operations and Oscar Siebert is trustee.

▶ The Moark Mining Corp. operating the Gloria, Red Mill, Minnie Lee, and Jack Pot, has its mill in operation and is producing a high-grade silicate of zinc concentrate. It has installed a new compressor and drift drill and will start soon to drive a new tunnel on a run of jack on the Jackpot property.

▶ Excelsior Mining Co., operating the Excelsior mine, near St. Joe, with the work in charge of Dyle Palmer, of Harrison, has its mill in operation again. It was closed down for several weeks because of a broken piston in an engine which was hard to replace.

▶ Reed Brothers, of Flippin, operating on the Fred Morton land 20 miles northwest of Flippin, have encountered a good run of carbonate with some jack in a new prospect tunnel.

▶ James Rogers, of Harrison, has taken over a lease on the Coon Hollow property at Zinc, and has installed a compresser and drill. His work to date has been cleaning out old tunnels, mapping out the ore run, and testing ore.

▶ The Newton County Mining Co., headed by Charles H. Herman, of Jasper, has its new mill at Jasper nearly completed. About all that remains to be done is to install four concentrating tables. The company will mill ore from its properties, which consist of Keys Gap, Blue Bluff, Spanish Lamar, Panther Creek, and Canton, and also do custom milling.

▶ Hurricane Mining Co., the operations of which are in charge of J. C. Shepherd of Harrison, is sinking the second development shaft on the Hurricane property near Pindall. The first shaft was sunk on the west wall of the St. Joe fault to a depth of 70 ft. In a cross drift across the fault the miners cut through 70 ft. of high-grade carbonate of zinc ore. The second shaft, 150 ft. north of the first, has been sunk to the same level and encountered the same run of ore as in the cross drift, which is not yet completed.

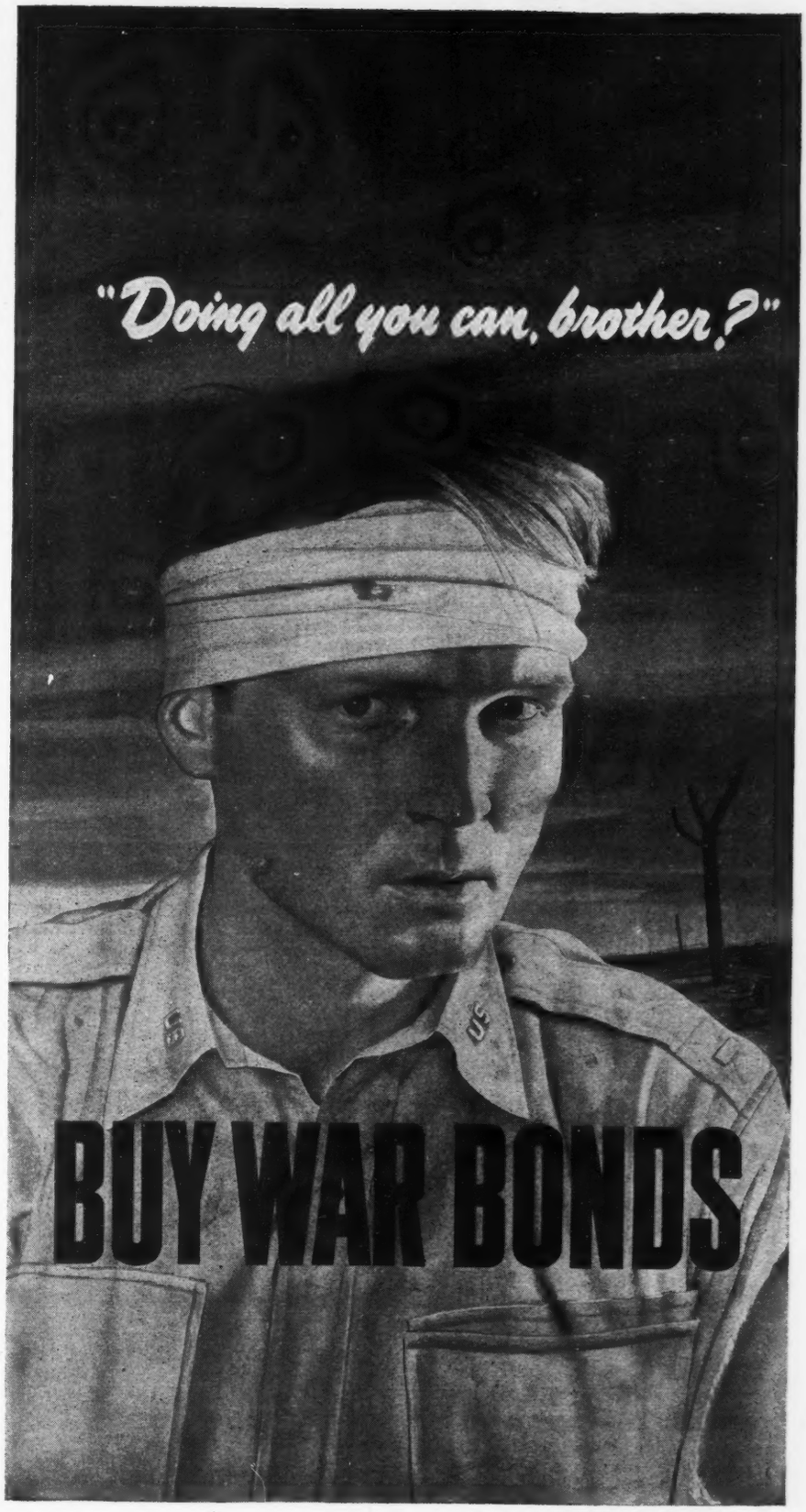
▶ To permit the American Cyanamid & Chemical Corp. mine several rich deposits of bauxite, the State Highway Department filed a petition for permission to relocate the western end of the Sweet Home cut-off somewhat north of its present junction with Highway 167. Permission has been granted for the relocation by County Judge Newton of Pulaski County.

▶ J. R. Thoenen, district engineer of the U. S. Bureau of Mines, has announced plans to extend bauxite drilling by the Bureau to Saline County. Most of the previous drilling has been confined to Pulaski County. Mr. Thoenen announced from his Little Rock office that the Bureau has discovered some 6,000,000 tons of bauxite in Arkansas, 60 percent of which is high-grade ore. He asked the cooperation of landowners who believe they have ore on their property. Funds for development and operation are available through the RFC.

▶ Geologists John M. Nelson and A. C. Waters, of the U. S. Geological Survey, are preparing a report on the Clark and Pike counties quicksilver district. At present they are headquartered at Amity. Two bulletins have previously been issued on this district, and the present work will bring information up to date.

▶ Cleve Byrd, of Harrison, manager of the A. R. Seabass Co., reports a satisfactory test run from the Baker and Brewer properties near Ponca, Newton County. The recovery was 22 tons of zinc concentrate from a 100-ton test batch.

▶ Because of the inability of the North American Diamond Co. to secure priorities on necessary equipment, the Arkansas diamond field, near Murfreesboro, will probably remain idle for the duration. Governor Adkins, while in Washington recently, put forth a strenuous effort to secure the neeessary priorities, without success.



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TRI-STATE

Bonuses Spur Activity Near Baxter Springs

Federal will not rebuild Gordon mill—Jane E is reviving Scott mine—Cameron and Henderson acquire Romo mill

▶F. H. Brownell, board chairman of Federal Mining & Smelting Co., has announced that the company will not rebuild the Gordon central mill, destroyed by fire in March. Arrangements have been made with the Eagle-Picher company to mill ore from the mines formerly served by this mill.

▶Mining activity in the west Baxter Springs area of the Tri-State district has taken on new impetus in recent months. Adjustment of quotas to permit the dewatering and mining of the low-grade ore deposits of this area has brought into production sizable tonages that otherwise would not have been minable. The initial revival of operations in this area was inaugurated some time ago by the Bilharz Mining Co., which expended considerable money in the dewatering of the old Barnsdall-Brewster leases. The company is now operating two shafts—Nos. 1 and 6—on the Brewster land, ore from which is being treated over the Bilharz mill. Operating as the Bilwil Mining Co., O. W. Bilharz and Lynn Wiles, of Baxter Springs, have reopened the old Ebenstein mill shaft, which adjoins the Brewster land on the west, and plan to sink another shaft on the lease, which was last mined nearly a score of years ago by the old Chanute Spelter Co. Ore will be trucked to the Blue Mound mill of the Dines Mining Co. The latter company reopened an old shaft and sank a new one in 1942 on the Hartley land, a short distance to the southeast. Another shaft has been reopened and is being deepened by the same company on the Hartley land just west of Baxter Springs. Mine operations at this shaft are to be carried on at the 295-ft. level in a sheet-ground formation, according to H. G. Weidman, of Baxter Springs, company manager. The Hartley ore will be treated over the Dines mill, north of Picher, in Kansas. Lula Bell Mining Co. has moved a large derrick and hopper from the Opperman lease, south of Baxter, to the old Cortez-King Brand Liza Jane mill smelter, a mile west of Baxter Springs. The lower workings of this mine have been dewatered and ore is being mined on the 295-ft. level and trucked to the company's mill near Hockerville. Earlier in the year the Eagle-Picher M. & S. Co. dewatered and reopened the old Velie Leopard lease, north of the Liza Jane, and now is shipping considerable tonnages by rail to the company's Central mill. On an adjoining lease the Beck Mining Co. has reopened a shaft on the Smith land, ore from which is trucked to the company's No. 3 mill, southwest of Baxter Springs, which was reconditioned a few months ago. A half mile to the northwest, Mineral Products, Inc., is still conducting operations at the Velie Swalley mine, ore from which is sent to the Mission Mining & Royalty Co. mill north of Quapaw for treatment. Farther west on the "D" tract of the Swalley land, Eagle-Picher, as agent for Metals Reserve, has completed a new shaft and reopened an old one, over which new derricks and 350-ton hoppers of wood construction have been built. The two shafts are being connected on the 321-ft. levels, from which ore will be mined and treated subsequently over the old Commerce Paxson mill, recently reconditioned throughout for handling 100 tons of ore per hour. The Paxson mine has also been reopened by the company under the federal agency's sponsorship, and ore is being removed in large tonnages through mechanization underground. A new shaft is being completed by Eagle-Picher-MRC operations on the adjoining Stoskopf land. A mile and a half further west the MacArthur Mining Co. is mining on the Embree lease, ore from which is trucked to the Beck No. 3 mill. Eagle-Picher also has completed a new derrick and 400-ton hopper of wooden construction over the east field shaft of the old Oklahoma Interstate Cherokee lease, north of Treece, from which the company will pull ore from the western portion of the 160-acre Webber lease. Mine operations are to be carried on from two levels—the 260 and 300-ft. A railroad spur has been extended to the mine storage hopper, and ore will be hauled by rail to the company's Central mill. The orebody on the old Cherokee lease was cut up to the line of the Webber lease several years ago at two or three places by the Oklahoma Interstate Zinc & Lead Co., under the supervision of the late C. F. Dike, widely known Tri-State mine operator. Eagle-Picher also is mining the Webber lease from the Inspiration and Northeast field shafts.

▶The Jane E. Mining Co. is sinking two new shafts on the Scott land, a mile southeast of Hockerville, according to J. L. Nelson, of Baxter Springs, general superintendent of the company. One of the shafts is situated between the K., O. & G. and the Frisco railroad lines on the south part of the Scott acreage, or about 1,000 ft. south of the company's east field shaft. It will be put down to a depth of 165 ft., where an upper run of ore will be mined, Nelson said. About 100 yds. south of the north field shaft, put down last year by the company in the north-central part of the large acreage, is the site of the second new shaft. This shaft will be put down to a depth of 265 ft. into the Reeds Spring formation, which is the same as that being worked in the north field shaft. Ore from the old as well as the new mine developments will be treated over the company's 50-ton-an-hour mill on the Scott land.

▶At the beginning of April, the Federal Mining & Smelting Co. placed its new Duenweg mill in operation and is now treating ore from its reopened mines in that area as well as ore from the new mine developments of the American Zinc, Lead & Smelting Co. on the Henckel-Smith land, three miles southeast of Duenweg.

▶A new shaft is being sunk by the Weidman Mining Co. in the northeast

part of the Oklahoma-Interstate Townsite lease, a 40-acre tract comprising the greater part of the town of Cardin, according to a report by H. G. Weidman, general manager of the company. The shaft will be put down to the 225-ft. level. Previous churn drilling in the immediate vicinity of the shaft was checked by recent drilling of the United States Bureau of Mines. When the shaft and other development work is completed, ore will be trucked to the company's Woodchuck mill, near by, for treatment.

▶S. E. Henderson, of Baxter Springs, general manager of Cameron & Henderson, Inc., has announced the company's purchase of the Romo Mining Co.'s mill, leases, mining equipment, and other holdings near Lincolnville. The mill, which has been operated the last several months as a custom mill by Luther Owen, of Joplin, has a capacity of about 40 tons of ore an hour. It is on the old Indian Catholic Mission lease, and was built from machinery and other equipment obtained from the dismantling of the old Century Zinc Discard mill, south of Baxter Springs. In addition to the Mission lease, which comprises 40 acres, Cameron & Henderson acquired the 98-acre Nevins lease, adjoining to the northeast. The new operator will continue to mill ore from the Craig Mining Co.'s operations on the Keeton land, west of Lincolnville, where preparations are under way to expand mine operation. Although not included in the deal, the company is continuing development work on the Vallier land, west of the Mission property. With the dewatering of the Romo mines, the company expects to place the mill on a 24-hour schedule of operation, Henderson said. L. S. Scofield, of Picher, will be general superintendent, and Kinney Blunk, of Treece, will be in charge of mill operations. Cameron & Henderson, who have been engaged in mining in the Picher field for many years, also operate the old Admiralty mines west of Douthat.

▶A 100-ton zinc and lead concentrator is being constructed by the Rex Beyer Mining Co. on the H. S. Lincicum land, three miles south of Diamond. Associated with Beyer in the company are Jesse and Jake Fullerton, both of Diamond.

▶Carson Mining & Milling Co. is rehabilitating the old Peacock mill, two miles southwest of Smithfield, in Kansas, preparatory to the retreatment of tailings in the old mining area bordering the north bank of Spring River, according to Leonard W. Goings, of Douthat, company manager. Goings also announced that a field shaft on the old "Three C" lease, west of Stotts City, has been reopened by the Capital Mining Co., of which he also is manager.

▶Hopi Mining Co. has dewatered the old Crane mine, in the Thoms Station mining area, northwest of Joplin, and now is mining on the 180-ft. level. Ore is trucked to the Grasselli custom mill of the St. Louis Mining & Milling Co., a short distance to the west. The company also has resumed sinking operations at a new shaft on the Chenoweth land and is completing preparations for the dewatering of the old Powhatan mine, near by. C. F. Denney, of Joplin, is manager of the company.

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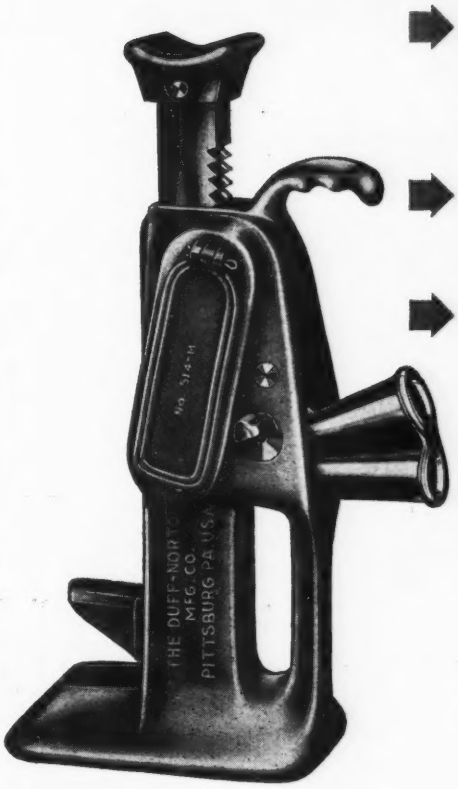

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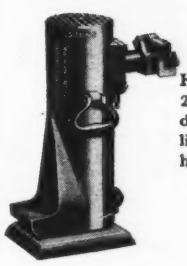

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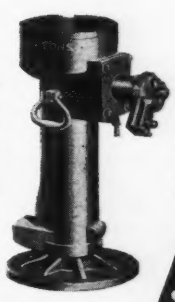

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IRON COUNTRY

Late Season Complicates Fulfillment of Quota

Good progress made in developing Mather orebody—Four-foot shaft drilled at Sherwood with cable tools—Pickands, Mather will develop Rabbit Lake deposit

▶ The first cargo of the 1943 navigation season was a load of limestone taken on by the boat "N. E. Leapold," of the Inland Steel Co., on April 2. The Inland Steel Co. boats "L. E. Block" and "P. D. Block" were the first to load iron ore for the season, taking on cargoes at the Escanaba docks April 4 after the icebreaker from the Sault St. Marie ferry service worked four hours cutting a channel 8 miles long through the ice. Ore is now moving over this dock not only from the Marquette and Menominee ranges, but some cargoes are going forward from the Gogebic Range. The icebreakers have the Mackinaw Straits channel open for boats from Lake Erie, but the cold weather in April has delayed opening up the Sault locks and St. Marys River into Lake Superior. Even with the 16 new Maritime Commission vessels increasing the number of boats in the iron-ore fleet to 311, it will require a very late shipping season to get the 95 million tons planned for this year down the Lakes. To help morale and create some fun, a guessing contest is offered by Butler Bros. A $25 war bond goes to the employee who guesses the closest to the minute, day, and hour that the first ore drops from the conveyor belt to the first screen in any Lake Superior washing plant.

▶ Good progress is being made at the Mather mine, at Ishpeming, in opening up the plats on the 1,600-ft. and 1,750-ft. levels. A type 125 Conway loader is operating on each level preparatory to driving the main drifts to the orebody simultaneously. The 12-ton skips have been tested through the shaft with loads of rock. Worden Allen Co. completed the permanent steel trestle, 60 ft. high, for stockpiling ore, and the new stockpile tram cars were received May 1.

▶ A new ore producer for this season on the Menominee Range is the open-pit Book mine, in the Crystal Falls district. Stripping started last fall in a small way and a surface area of about seven acres has been worked over, with the ore exposed at the center at a depth close to 40 ft. The North Range Mining Co. is the operator. President and general manager is R. S. Archibald of Negaunee.

▶ In 1918 the Charcoal Co. of America installed one of the finest steam-driven hoists available for deep shaft hoisting at the Yale mine, near Bessemer, Mich. Subsequent sinking and developing were a disappointment, and the mine was shut down in 1922. Nothing is now left of the surface equipment but the steel headframe and the brick buildings. Recently, W. A. Knoll, district superintendent of Pickands, Mather & Co., petitioned the Bessemer city council to reduce the assessed valuation from $150,000 to $50,000. At this figure the P. M. Co. would be interested in taking an option on the property for the purpose of exploring for ore; it would pay the current taxes and the fee owners of the Yale mine would pay $21,000 in delinquent taxes. The City Council granted the petition and passed it on to the State Tax Commission for approval.

▶ At the Sherwood mine of the Inland Steel Co., near Iron River, a new ventilating shaft has been completed to a depth of 400 ft. The shaft is 48 in. in diameter, and was sunk with a heavy type blast-hole drill. A pilot hole 12 in. in diameter is first drilled to the bottom, or 400 ft. A reaming bit 30 in. in diameter is then used with the 12 in. hole as a guide and allowing the drilled material to pass through to the bottom, where it is removed. After this hole is completed a 48 in. reamer is used with the 30 in. hole acting as a guide and drain. This is the largest diameter hole sunk by this process in the Lake Superior region.

▶ Butler Bros. announce that the ore property recently leased from the Sargent Land Co. and formerly known as the Sargent Reserve (N.W.-N.E. Sec. 7-57-20) has been renamed the Burrall mine, in honor of Frederick P. Burrall, of Marquette, Mich. Mr. Burrall is president of the Longyear Realty Co. and the Longyear Corp., which are interested in 15 mines on the Mesabi Range and have extensive holdings on the Gogebic Range. Mr. Burrall's experience in Lake Superior mining dates back to the nineties, when he was associated with the E. J. Longyear Co. in drilling operations. He has also been in charge of mining operations in the West, Mexico, Spitzbergen, and on the Yukon. The Burrall mine is listed as having reserves of 1,500,000 tons. No plans for immediate development have been announced.

▶ Pickands, Mather & Co. recently announced plans for the development of the iron deposits under Rabbit Lake, on the Cuyuna Range near Crosby. This property is under lease to the Youngstown Mines Corp., for which Pickands, Mather & Co. operate. The ore in this deposit is an extension of the Kennedy mine, which was the first shipper from the Cuyuna Range, in 1911. The reserves under the lake are said to be over 7,000,000 tons. Drilling has been carried on for several winters through the ice.

▶ Republic Steel Corp. has started stripping the south portion of the Susquehanna mine, at Hibbing. This will develop a new area in the pit and will be a trucking operation.

Lake Superior Safety Meeting in June

THE Lake Superior Mining Section of the National Safety Council will hold its 20th annual conference in Duluth on June 17 and 18. Headquarters will be the Hotel Duluth. The conferences are sponsored by the iron and copper mining companies of the Lake Superior region and are for the purpose of promoting

safety and of exhibiting safety equipment or other material that might be helpful in the reduction of accidents.

MICHIGAN

Allouez No. 3 Shaft Sinking in Ore

Will be carried to depth of 3,000 ft.—Torch Lake tailings dredge is launched—Peninsula said to be second in output

▶Calumet & Hecla's new Allouez No. 3 shaft, which is being sunk in the Houghton conglomerate lode, is proceeding in ledge. The changing wall of the vein has been located and samples of the rock show copper deposition. It is the intention to sink this shaft to an inclined depth of 3,000 ft. or more. Temporary buildings consisting of change house, tool house, garage, and compressor house have been erected, two power lines have been built, and a good start has been made on the permanent "dry."

▶The hull of the large dredge which will be used to supply copper-bearing sands for the new Quincy tailings reclamation plant, at Mason, on Torch Lake, has been launched and is well on the way to completion. The hull is built of Washington fir and is 100 ft. long and 72 ft. in width. Its weight is more than 200 tons, 12 tons of which is the weight of the bolts holding the timbers together. R. C. Buck, Inc., which is building the new plant near Mason, is also constructing the dredge. There are over four miles of caulking in the bottom and deck. In addition to the hull, a large number of pontoons are being built at the shore yard. Because of the scarcity of steel, wood is being used for both base and over-water equipment. When the dredge goes into service, the pontoons will carry the conveyor pipe through which the copper-bearing tailings will be brought to the plant for treatment.

▶According to T. M. Broderick, geologist of the Calumet & Hecla Consolidated Copper Co., the Michigan copper district, with a total of over nine billion pounds of copper produced in a period of nearly 100 years, is second only to Butte, Mont., in total production. About half of the Michigan copper came from the Calumet conglomerate bed, now mined out. The six major amygdaloid lodes have accounted for the greater part of the remaining output. All fissure veins to date have produced only 200 million pounds. The known big lode deposits lie within a stretch of about 25 miles between Painesdale and Mohawk, mostly in Houghton County, but extend a short distance into Keweenaw County. Despite many efforts over the years, no major lode has been developed in Ontonagon County, the total production of which has been only 200 million pounds. At some future time when copper becomes scarcer and commands a higher price, the many smaller and spottier deposits, such as those of Ontonagon County and the fissures of Keweenaw County, may become of commercial importance.

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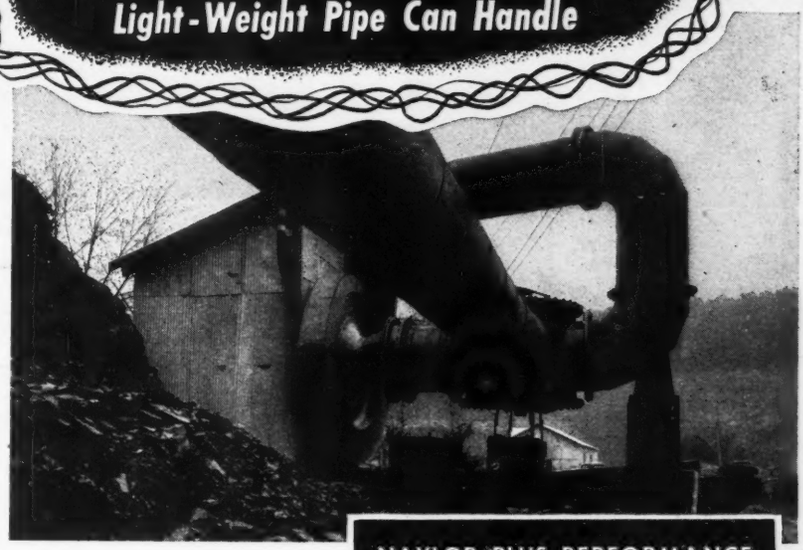

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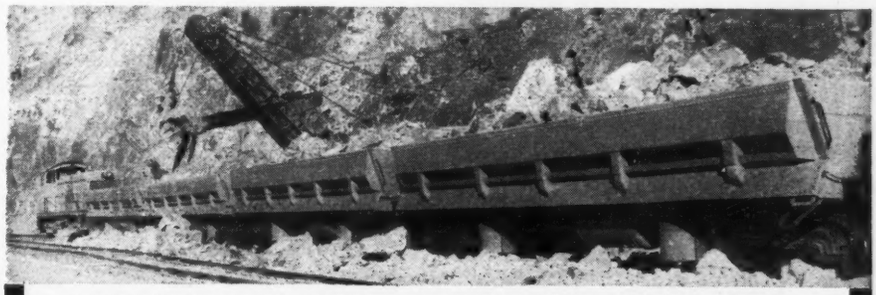

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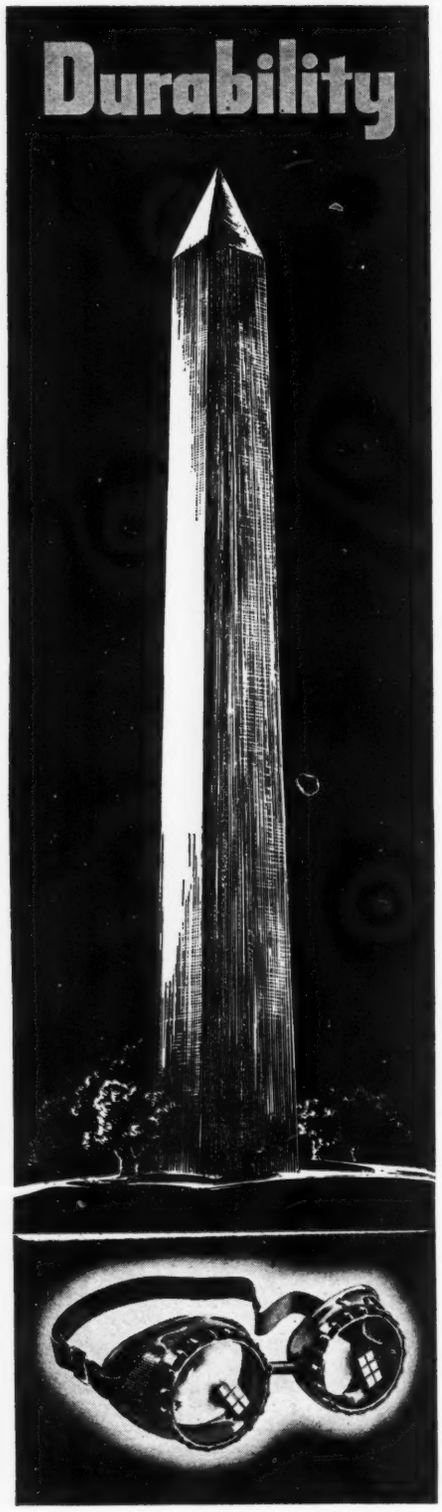

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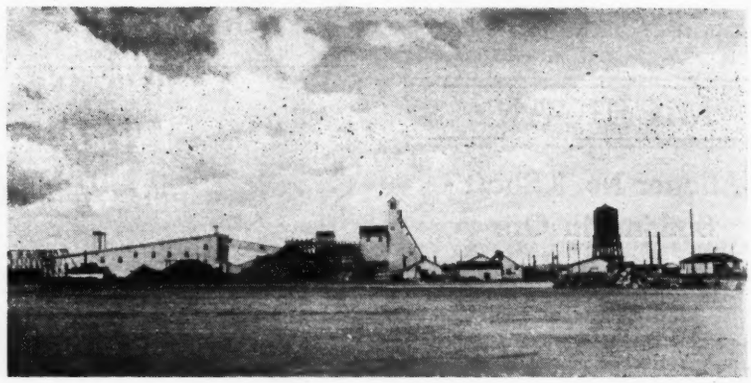

View of surface plant of Sladen Malartic Mines, Ltd., Malartic, Quebec

CANADA

WPB Eases Restrictions On Gold-Mining Supplies

New chrome concentrator in operation—Company organized to operate iron properties—Consolidated shows good profit despite low prices

▶ The February directive of WPB preventing the shipment to gold mines of equipment valued in excess of $500 a month was amended on or about April 10 to allow purchases to be made as formerly until further notice. Canadian gold mines that require supplies valued at less than $500 a month are permitted under CMP Regulations No. 5 to have orders cleared through the Ottawa office of the Metals Controller.

▶ A statement was recently given in Parliament by the Minister of Munitions and Supply on extensive mining operations that are being financed by the Wartime Metals Corp. on behalf of the Canadian and United States governments. Operating costs are being met through subsidies and the property owners receive royalties for the metals produced. At the end of the war it will be possible for the owners to purchase the mining plants on reasonable terms. Several properties are being operated by established mining companies for government account to secure increased output of critical and strategic minerals. Capital assistance of $1,000,872 had been made up to the end of 1942 for Quebec production of chrome, molybdenite, and lead-zinc ores; $30,000 for molybdenite in Ontario; and $25,030 for copper production in British Columbia. The value of $5,349,803 was officially given for raw material stocks on hand Dec. 31, 1942, of tin, tungsten ore, chrome ore, molybdenum, and vanadium, in the order of their respective value.

QUEBEC

▶ J. Y. Murdock, president of Noranda Mines, reports revenue at $21,451,956 for 1942, $536,034 lower than in the previous year, with a reduction of $453,067 in cost of production. Net working capital increased to $18,523,409 and assets advanced to $55,450,843. No mention is made of metal production or of ore reserves, but the vice president and general manager, H. L. Roscoe, estimates that the 1942 rate of gold and copper production can be maintained for 15 years from ore blocked out above the 2,975-ft. level. Exploratory work below the Lower-H orebody, down to the 45th level at 5,975 ft., has failed to find better than submarginal material, except for an oreshoot having a good gold content. The depth program is being continued from the No. 6 shaft.

▶ In the annual report of Waite Amulet Mines, T. E. Little, mine manager, states that 212,038 tons had been added to the Lower "A" orebody by diamond drilling and another 15,000 tons of high-grade zinc ore having a low copper content had been added to the "C" orebody. Since February, when the enlarged concentrator came into use, the Lower "A" has been supplying 1,200 tons a day, the "C" 300 tons, and the Waite mine 300 tons. Test work in 1941 resulted in the addition of zinc flotation cells to the original mill circuit to secure improved recovery. In the vicinity of the C shaft, exploratory work is being started this spring on the B, D, and E orebodies. Assets of Waite Amulet total $7,862,467 and those of the subsidiary Amulet Dufault Mines amounted to $16,805,489.

▶ Ore reserves of 2,682,000 tons are reported for East Malartic Mines by the general managers, Futterer and Reid, for an increase of 512,000 tons over the figures for the previous year. This represents the mine workings above the tenth level and does not include 762,000 tons remaining in pillars. Additional blocks have been developed below the Sladen fold and in the east orebody below the fourth level. The present crew of 380 must be increased to 525 men before daily production of 1,500 tons can be maintained efficiently. Net profits are reported by the president, A. J. Davis, as less than half the figure for 1941, and working capital advanced from $681,037 to $1,120,236. The average grade of ore reserves increased slightly to $8.316 a ton.

▶ The annual report of Malartic Gold Fields, submitted by the president, M. A.

Thomson, shows increased output resulting from stepping up the milling rate from 614 to 682 tons a day. Recovery per ton advanced from $7.43 to $7.80, with total gold production in 1942 valued at $1,940,638. Four large orebodies and several smaller ones were opened up by development work on three levels from the No. 2 shaft, in the west area. The No. 1 east shaft developed 708,885 tons above the 900-ft. level. J. P. Norrie, general manager, reports that ore reserves estimated at 6,000 tons to the vertical foot in the vicinity of the No. 2 shaft have been confirmed by work so far carried out to a depth of 500 ft.

▶The new 600-ton concentrator at the Chromeraine chrome mine, in the asbestos district of the Eastern Townships, was expected to go into operation before the end of April. The project has received government financing to the extent of about $800,000 and is expected to provide a chrome supply for the Canadian munitions industry.

ONTARIO

▶A shutdown within the next few months is threatened for Jerome Gold Mines unless there is a pronounced increase in the number of men available. The annual report of president J. H. C. Waite gave operating results for the first full year since the mine started production in September, 1941. Original estimates of reserves were revised downward to 328,422 tons.

▶Michipicoten Iron Mines has been organized to acquire three properties north of the New Helen mine of Algoma Ore Properties and 20 miles from Michipicoten Harbor, Lake Superior. Under the former control, by Ventures, Ltd., Frobisher Exploration, and Sherritt Gordon Mines, a program of diamond drilling and underground exploration to a depth of 1,055 ft. had been carried out. The draining of Parks Lake was completed in October last year and some shipments of hard lump ore were made for testing purposes. Above the sixth level of the Josephine mine 1,271,100 tons of 51.3 percent hematite are estimated, with a silica content of 21 percent. On the Lucy property diamond drilling indicated 11,200,000 tons of siderite with an average iron content of 34.5 percent. A 500-ton sintering plant is under consideration.

▶At the annual meeting of Pamour Porcupine Mines the president, J. Y. Murdock, stated that the normal payroll of 343 employees had been cut down to 156. This had made it necessary to hold development to a minimum and to draw on broken ore reserves to the extent of about 10,000 tons a month. Development costs dropped from 61c to 43c a ton and mining costs were down from $1.36 to $1.05. Ore reserves are adequate for about three years at the present rate of 1,500 tons daily, as compared with the 1,612 tons permitted by regulations of the Metals Controller. The mine manager, C. E. Anderson, reported net profits of $538,000 in 1942, at the rate of 94c per ton from an average grade of $4.08.

▶Shareholders of Aunor Gold Mines heard encouraging information from President J. Y. Murdock at the annual meeting on April 9 when it was explained that poor results in the first 1,000 ft. of drifting on the 1,375 and 1,500-ft. levels had been followed by discovery of an oreshoot having an estimated length of at least 1,200 ft. The grade averages 0.28 oz. per ton over a width of 5.1 ft. on the 1,375-ft. level. Up to April 1 the mine manager, S. S. Saxton, reported that the new oreshoot on the 1,500 level had been developed for a length of 668 ft., with indications of an extension for at least another 100 ft. Here the grade is 0.325 oz. per ton over a 5-ft. width. Working capital has been built up to $670,000. The 1942 mill rate of 470 tons a day has been lowered in the first three months of this year to about 445 tons. A new hoist has been installed to operate the 3-ton skips that have replaced those formerly used of half that capacity.

▶J. Gordon Hardy, president of Falconbridge Nickel Mines, has issued his annual report, showing that an increased rate of output will be in effect early in 1943 as a result of the larger plant facilities being installed at the request of the government. High construction costs cut down net profits from $993,986 to $731,902 on a considerably higher income from sales and investments of $7,674,289. Net working capital increased to $6,903,578, and assets, less depreciation, were up slightly at $13,362,635. E. Craig, manager, reported a small gain in ore reserves at the Falconbridge mine, and 750,000 tons

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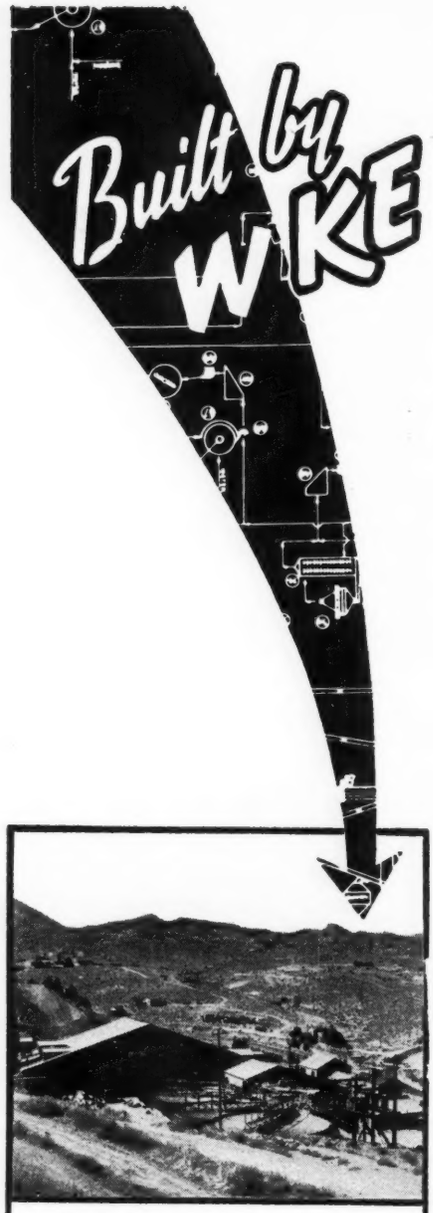

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▶CANADA

were added in drilling several other properties in the district. The original increases in mill, sintering plant, and smelter, completed last year, have been followed by further expansion of the smelting plant. The consulting metallurgist, Anton Gronningsater, stated that 1942 production was 8 percent higher than that of the previous year. Metallurgical losses are still high after effecting some improvement.

BRITISH COLUMBIA

▶ During the year ending Dec. 31, 1942, the gross value of production of Silbak Premier Mines, Ltd., Portland Canal subsidiary of Premier Gold Mining Co., Ltd., was $1,413,768, from the treatment of 140,567 tons, averaging 0.27 oz. gold and 4.05 oz. silver per ton. Gross profit, after deduction of operating expense of $810,766 and miscellaneous losses of $33,654, was $593,788. This profit, compared with $593,347 from a much larger production in the previous year, reflects the slightly higher grade of ore mined and the reduced expenditure for development and ore breaking. After provision for depletion, depreciation, taxes, and outside development, net operating profit was $265,182. The reserve for depletion was reduced by $134,818 to provide for the distribution of $400,000 in regular quarterly dividends. Exploration and development comprised 7,423 ft. of drifting, crosscutting, and raising, and 22,116 ft. of diamond drilling. Assured and probable ore reserves, broken and unbroken, were estimated at 149,269 tons, averaging 0.24 oz. gold and 2.85 oz. silver per ton, as of Dec. 31, 1942.

▶ Privateer Mine, Ltd., in the Zeballos district, produced 22,356 oz. gold and 8,837 oz. silver, valued at $866,763, from 25,073 tons, averaging 0.92 oz. gold per ton, in the fiscal year ending Dec. 31, 1942. Net operating profit was $330,591; working capital was increased to $376,347; and dividends paid aggregated 13c. per share and involved distribution of $319,030. Despite a reduction of one-third in production, a corresponding decline in operating expense permitted a satisfactory profit ratio. This was achieved partly as a result of earlier development and partly by gradual depletion of broken-ore reserves. Development work included 2,925 ft. of drifting, 405 ft. of crosscutting, 697 ft. of raising, and 663 ft. of diamond drilling. At the end of the year ore reserves were estimated at 31,155 tons, averaging 0.482 oz. gold per ton.

▶ Production of Bralorne Mines, Ltd., operating in the Bridge River district, during the fiscal year ended Dec. 31, 1942, was 90,816 oz. gold, valued at $3,425,307, from 171,095 tons, averaging 0.547 oz. gold per ton. Gross operating profit was $2,252,663, after deducting direct costs of production. After provision of $88,400 for depletion, $158,000 for depreciation, and $574,989 for income and excess profits taxes, net profit for the year was $1,393,777. Dividend payments aggregated $1.20 per share and involved disbursement of $1,496,400. Development work, comprising 9,872 ft. of drifting and crosscutting, 1,271 ft. of raising, and 10,886 ft. of diamond drilling, was effected at a cost of $175,773, equivalent to $1.03 per ton milled. Fully developed and reasonably assured ore reserves were estimated at 999,000 tons, averaging 0.498 oz. gold per ton on Dec. 31, 1942, representing a slight increase in both tonnage and grade. This includes 59,305 tons of broken ore averaging 0.52 oz. gold per ton. Recovery reached the all-time high of 97.0 percent. During the year the Buccaneer mine, on Vancouver Island, was closed and all equipment removed. Enough work was done on the Yalakom property to allow crown-granting of important claims. Additional development is contemplated after the war. Other promising gold prospects in eastern and western Canada are being held at nominal cost and will be explored at a more propitious time. At the year end work was in progress at three strategic-mineral properties, one of which was being equipped for production. Milling operations were suspended on Oct. 31, 1942, by Summit King Mines, Ltd., wholly owned subsidiary at Fallon Nevada.

▶ Copper, gold, and silver valued at $4,474,615 (U. S.) was produced by the Granby Consolidated Mining, Smelting, & Power Co., Ltd., in the fiscal year ended Dec. 31, 1942. Operating expense was $3,737,134; provision for depletion was $34,317, for depreciation $356,915, and for mineral, income, and excess profits taxes $145,624. Net operating profit was $300,504, equivalent to 67c. per share. Dividend payments aggregated 70c. per share, involving distribution of $315,163. Development work consisted of 5,140 ft. of drifting and crosscutting, 9,144 ft. of raising, 14 ft. of sinking, and 16,649 ft. of diamond drilling. Estimated ore reserves were increased by 205,280 tons. The company entered into a new agreement with the Canadian government, through the office of the Metals Controller, to sell for the account of Metals Reserve Co. its production for the duration of the war at cost, plus a reasonable royalty. This agreement became effective Nov. 1, 1942, but the full benefits were not realized until late in the first quarter of 1943.

▶ During the fiscal year ended Jan. 31, 1943, Cariboo Gold Quartz Mining Co., Ltd., produced 34,762 oz. gold and 2,981 oz. silver, valued at $1,339,431, from 88,692 tons, averaging 0.4128 oz. gold per ton. A net profit for the year's operations of $109,260 was earned after payment of $22,824 for mineral taxes; $16,731 for shipping and mint charges; $893,386 for mining, milling, and development; $35,514 for administrative costs; and provision of $101,936 for depreciation, $88,692 for depletion, and $72,847 for income taxes. Estimated ore reserves as of Jan. 31, 1943, were 423,311 tons, averaging 0.398 oz. gold per ton, a net decrease of 18,361 tons in the twelve-month period. March production was 1,984 oz. gold, valued at $76,384, from 5,222 tons of ore milled.

▶ Island Mountain Mines Co., Ltd., Cariboo district subsidiary of Newmont Mining Co., produced 21,043 oz. gold and 2,901 oz. silver, valued at $811,156,

from 47,916 tons, averaging 0.439 oz. gold and 0.06 oz. silver per ton, during the fiscal year ended Dec. 31, 1942. Net operating profit was $213,646; net current assets were increased to $279,353; and dividend payments were $136,593, equivalent to 13c. per share. Development work consisted of 2,605 ft. of drifting and crosscutting, 326 ft. of raising, 451 ft. of internal shaft, and 18,645 ft. of diamond drilling. Estimated ore reserves, as of Dec. 31, 1942, were 71,000 tons, averaging 0.456 oz. gold per ton. March production was 1,048 oz. gold, valued at $40,361, from 2,401 tons, averaging 0.4366 oz. gold per ton.

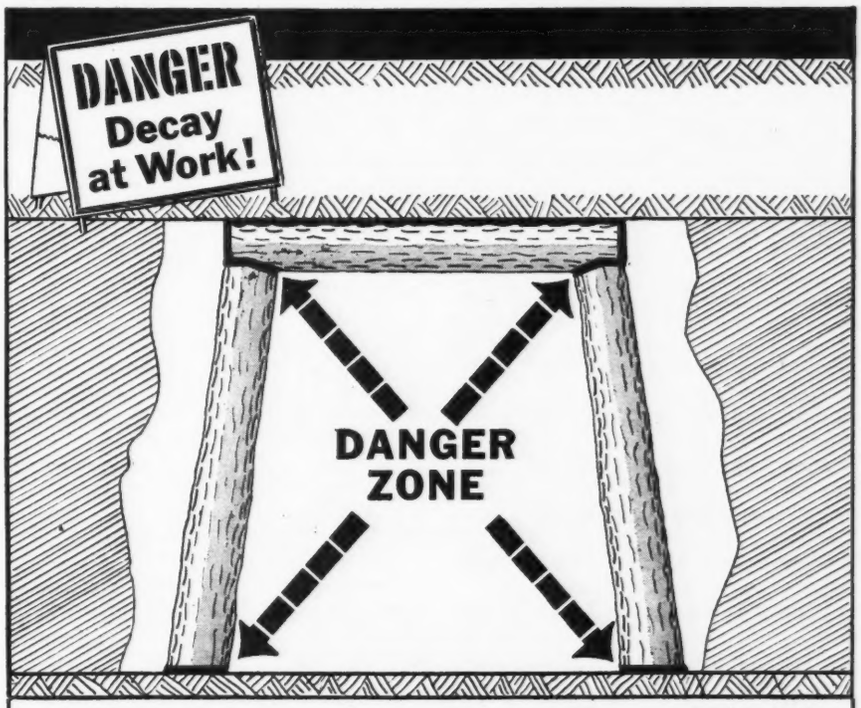
▶ Operations of The Consolidated Mining & Smelting Co. of Canada, Ltd., during the fiscal year ended Dec. 31, 1942, showed a profit of $19,001,619 before provision for income and excess profits taxes, but after all other charges including $914,236 for mine development, exploration, and abandoned development; $4,899,237 for depreciation of plants; and $1,303,651 for depreciation of investments in subsidiary mining companies. Net profit was $12,201,619 after providing $6,800,00, or 2.08c., per share, for income, excess profits, and mineral taxes. Appropriations of $500,000 for addition to the insurance reserve and $4,000,000 for post-war contingencies were made from unappropriated earned surplus. Shareholders received $1 per share in dividends and $1.50 in bonuses, involving total payment of $8,189,553. Great Britain has received a very large part of its supply of lead and zinc from Consolidated. Apart from the fact that the necessary tonnage could not have been procured in the United States, when compared with the cost at the current U. S. prices for lead and zinc the prices paid have effected an annual saving to Great Britain of approximately $22,000,000. In 1941 two increases were made in the capacity of the plant at the mercury property at Pinchi Lake, B. C. The plant now possesses over twenty times its initial capacity of less than three years ago. At the request of the Dominion government the capacity of the mill at the Red Rose tungsten property near Hazelton, B. C., was enlarged. The output of tungsten concentrate from this property will be further increased on the completion of certain underground work now being carried out. The metallurgical and chemical plants at Trail were operated at full capacity, and increases in production were made in every department. Recoveries were satisfactory, but costs increased. Mining costs at the Sullivan mine, the world's largest zinc-lead-silver producer, increased because of preparations for stope-filling, taking more ore from the lower levels, and higher wages. Ore reserves have been maintained in spite of the increased tonnage mined. Production of tin from the Sullivan concentrator tailings was commenced early in the year. The tin is smelted and refined in an electric furnace, and the process has been most successful. Because of continued unfavorable operation, the Big Missouri gold mine was closed and dismantled. Operations at the Box gold mine, on Lake Athabaska, were suspended for the duration of the war, because of the labor shortage and the low-grade nature of the ore. The Ptarmigan gold mine, at Yellowknife, N. W. T., was closed because of the labor shortage and government restriction on tonnage. The Con mine, also at Yellowknife, continues to operate satisfactorily, but present restrictions on gold mining prevent use of new plant extensions, and it may become necessary to suspend production. The Caribou gold mine, in Nova Scotia, continues to operate satisfactorily on a small tonnage.

YUKON TERRITORY

Proposed changes in the Yukon Quartz Mining Act, as recommended by the Prospectors and Developers Association, a Dominion-wide organization with head office in Toronto, are being opposed by Capt. George Black, M. P., on the grounds that they would permit "blanketing." The Yukon member's stand has been endorsed by the Yukon Order of Pioneers, the British Columbia Chamber of Mines, and other public bodies in the Yukon and British Columbia.

▶ The Yukon Consolidated Gold Corporation, Ltd., plans to operate only five of its ten dredges during the coming season.

▶ Clear Creek Placers, Ltd., the McRae-Patty company, will operate its 5-cu.ft. bucketline dredge on Clear Creek this season. Most of last season was spent in transportation and reconstruction.



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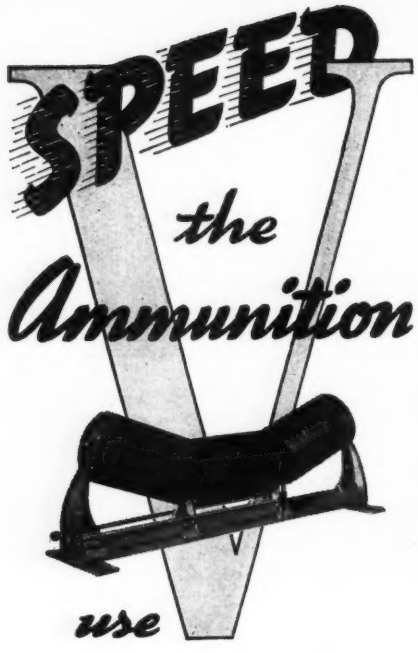

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MEXICO

Pay Increase Reduces Labor Troubles

Cananea is expanding operations—Broad road construction program to aid mining—Labor Confederation demands 10-peso minimum national wage

▶ Mexican mining took a much better trend as spring advanced, an important factor in this improvement being the almost complete settlement of pending labor problems. Practically all companies have increased wages and allowed the workers other economic concessions. This was in accordance with the suggestion of President Camacho, when it looked as if a strike against the 67 major companies was a certainty, for a compromise between mining capital and labor on the basis of a 10 percent pay hike and the miners pledging themselves to get down to work.

▶ Transportation, particularly rail, continues to bother some sections of the industry. Some companies are also hit by a lack of oil, a situation that is also afflicting other branches of industry and agriculture as well, and which Pemex, the government's oil company, blames on rail transportation. The National Railways, Mexico's largest railroad, declares it is not at fault, as it is promptly moving all oil and petroleum products that Pemex is shipping.

▶ The federal and state governments are pushing their road building and reconditioning program, a prime object of which is to aid mining in regard to transportation.

▶ Cananea Consolidated, Cananea, Sonora, has sent out a call for such skilled labor as carpenters, plasterers, bricklayers, steam shovel and diesel-tractor operators, electricians, and first-class mechanics, for work connected with expansion of its mining operations.

▶ A mining bank, the Bancaria Comercial y Minera, S. A., has been organized in Mexico City by Ing. Ignacio S. Bonillas. The bank is to open soon with a capital of 500,000 pesos ($105,000). It will make Mexico's sixth bank that specializes in mining financing.

▶ San Luis Potosi and Sonora have been declared free of labor difficulties, a situation that is expected to last for the duration, by the national miners union. That was accomplished, the union said, by all companies in those states making pacts with their workers that feature a pay hike of 10 percent. Sonora fell into line when two companies that had been holding out, and against which a strike had been threatened, the Sonora Graphite and the Cia. Minera de San Jose, S. A., both American-owned and operating in the Guaymas sector, made a contract allowing a 10 percent wage increase. Both companies are small, Graphite employing 52 men and San Jose 28.

▶ Mining in Aguascalientes, Jalisco, and Zacatecas has increased with the putting to work of many tracts that had long been idle because they could not be profitably operated, the National Commission for Stimulation of the Mining Industry reports. Several of these tracts contain mercury. The statement said that a company organized by Gen. Leopoldo Ortiz Sevilla has acquired mercury mines on the Zacatecas-Aguascalientes border that were once owned by Gen. Saturnino Cedillo, who was killed during a supposed revolt against the Cardenas government in January, 1939. Mercury and tin mining is to be undertaken in the Lagos and Los Altos districts, Jalisco, by companies that are being formed, and copper mining has come back in the Coalcoman and Sierra de Comanja regions, Michoacan. The federal and state government are building and reconditioning roads that serve the areas of this new mining activity.

▶ Section 12 of the national miners union has asked the Chihuahua government to intervene to bar politicians from participating in the distribution of 72,000 pesos ($14,850) that Ascarco paid to enable employees of its Hidalgo del Parral unit to found a consumers cooperative society. The section told the government that it wants politicians to be kept entirely out of the distribution of this fund.

▶ Mining in a wide sector of the border state of Coahuila is to be benefited with regard to better roads with the authorization by President Camacho of a federal expenditure of $750,000 to recondition the trunk highway and branches between Saltillo, the state capital, and Piedras Negras, on the border. These roads serve a large part of Coahuila's mining regions.

▶ The labor ministry is striving to end work difficulties that have arisen for the Cia. Altos Hornos de Mexico, S. A., the American-government and American Rolling Mills-backed enterprise that is establishing an iron and steel works at Monclova, Coahuila. These difficulties result from the demand of Section No. 147 of the national miners union that it have exclusive say in the hiring of workers for the plant, on the ground that it is a mining products enterprise. The company, in refusing this privilege, contends that it must have the right to choose some workers, because all of its work will not be with mining products.

▶ Holders of stock worth 50 centavos (11c.) per share in the Negociacion Minera de San Rafael y Anexas, S. A., that went into liquidation some time ago, are receiving a payment on account at the rate of 15 centavos per share. This payment was ordered by the company's liquidation board.

▶ The Ministry of National Economy announces the suppressio.. of the mining agency it maintained for some time at Monclova, Coahuila, because of its territorial overlapping. The agency's business has been consolidated with the ministry's mining office at Saltillo, the Coahuila capital.

▶ Sponsored by the national miners union, which has provided him with a small made-in-Mexico plane, "El Minero Mexicano" ("The Mexican Miner"), Ramo Leal, a young civilian pilot, is preparing a good will non-stop flight

from Merida, Yucatan, to Montreal, Canada, some time between May 20 and June 10. The time of the take-off depends upon climatic conditions. Leal expects to make the flight in 13 hours.

▶Announcement is made by Governor Enrique Fernadez Martinez, of Guanajuato, that American and Mexican interests, represented by Walter Hood Broadfield, Lorenzo Cue, and Emilio Lanzagorta, are arranging to establish at Irapuato, key industrial and railroad center of that state, an iron and steel works that will specialize in the production of agricultural implements, heavy industrial machinery, and railroad rails and wheels for rail locomotives and other rolling stock. Governor Fernandez Martinez said that President Camacho is personally interested in this plan. Its principals are holding interviews with the President. The Governor intimated that work on the plant will start late this spring. The plans call for the works to have a special section for the treatment of copper and other metals.

▶The Cia. Minera Apodaqueña No. 2, operating near Chihuahua City, has voluntarily raised wages by 10 percent, according to the national miners union, which praised this action and declared that it is an example for all mining companies in Mexico.

▶The Confederation of Mexican Workers, powerful labor organization of which the union is a member, is demanding a record minimum daily wage for Mexico, 10 pesos ($2.10) for the 1944-45 term. The confederation declares that living costs have so increased in Mexico that this wage is fair and reasonable. The present national minimum daily wage is 2.50 pesos. The government fixes the minimum daily wage every two years.

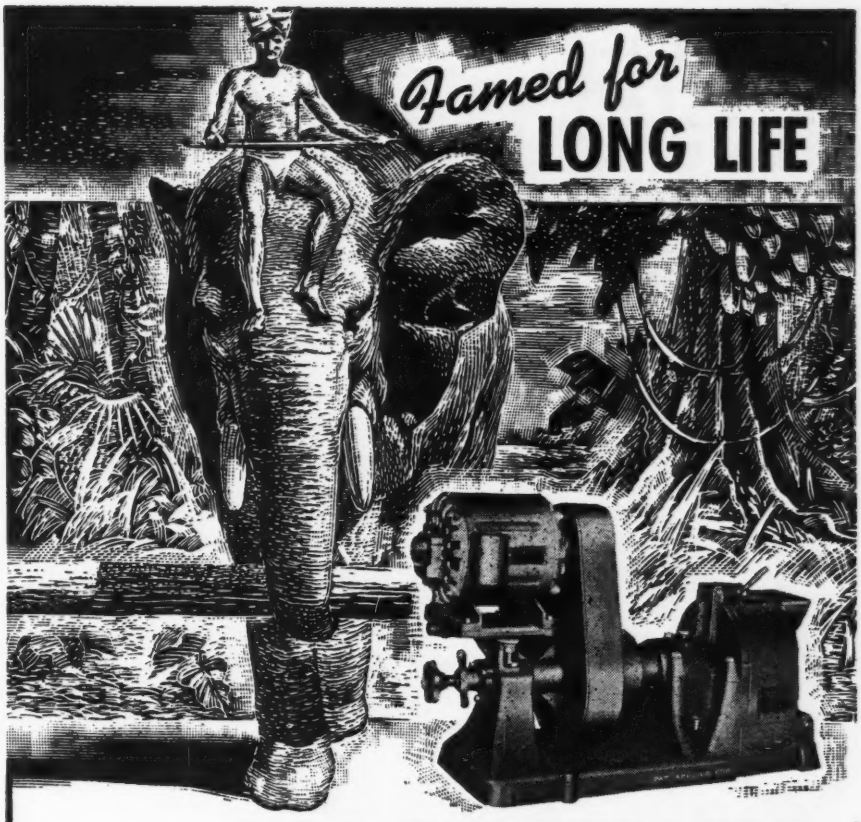
▶A one-day strike at the important La Boquilla electric power plant in Chihuahua late in April was ended when the government induced the workers to accept a 15 percent wage increase instead of the 30 percent sought. Stoppage of the plant embarrassed production at several important mine and smelting plants, including Avalos, Parral, Santa Barbara, and San Francisco del Oro.

Persian Agreement Binds Iron Ore for Pigments

ON APRIL 8, the United States concluded its twenty-seventh reciprocal trade agreement since the passage of the first Reciprocal Trade Act in 1934, the new treaty being with the kingdom of Iran. In the agreement the United States reduced its import duty on cut turquoise and bound iron ore for pigments on the free list.

Ooregum Gold Mining Passes Dividend

OOREGUM Gold Mining of India is omitting the dividend on its preference shares. The reason is the fire in its Bullens section, which did not permit a resumption of mining until Dec. 10. Last year 15 percent was paid on its 10 percent cumulative preference, and 5 percent on its ordinary, shares.



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BOLIVIA

Mine Labor Situation Is Serious

Prices are inadequate to afford reasonable wage standards—Agitators also active—Nineteen killed in violent strike—United States mission studies problem

▶ Nowadays, following Bolivian government instructions, practically no statistics of minerals production are published. Banco Central de Bolivia, in its report for 1942, gives the following data: Total mineral exports in 1942 amounted to 90,093,428 kilos, or 0.69 percent over those for 1941. This slight increase was due to wolfram, antimony, silver, and zinc exports. Tin exports went down, in relation to 1941. This means that in spite of the demand for tin and other strategic minerals typical of Bolivia and needed by her allies, Bolivian mineral production remains unchanged, underdeveloped, and not up to the situation. Although several factors are responsible for the situation, the two main ones are costs and labor. While the prices paid for tin, wolfram, and other mineral products of Bolivia are fixed by contracts signed with the Metals Reserve Co., and at figures lower than those registered in the first World War, costs of production have been going up continually. The cost of materials and machinery from the United States is high and only small amounts are received under all kinds of restrictions. With the inadequate supply, new projects cannot be carried out, and production is barely maintained.

▶ Contracts with Metals Reserve Co. were renewed in March for the Bolivian production of antimony and copper. The new contract term lasts until the end of this year. Prices and other stipulations remain substantially the same.

▶ Regarding labor, its scarcity has become acute. Low wages and a low standard of living, together with the poor handling of such problems, and the work of international agitators, have brought the situation to a critical point. One of the bloodiest strikes in the history of Boliva occurred in Patino's Catavi, at the end of December. The government reported 19 dead. Unable to close its eyes any longer to the labor situation, the government invited a U. S. mission of labor experts to come to Bolivia, to work under Ministerio de Trabajo y Prevision Social, investigate the problems, and recommend what was to be done. The mission was headed by Judge Calvert Magruder, of Boston, and staffed by five representatives of various official and private labor agencies. The mission came to Bolivia in February and left in March. The report of its findings and recommendations is still under study by the Bolivian government.

▶ It is likely that, to enact a program of better living conditions for workmen, and raise their wages, an increase in the price paid now for Bolivian mineral exports will be sought.

CHILE

1942 Copper Production Sets All-Time Record

Manganese development is expanding—Gold production hit by high costs—BEW to ease mine supply shortages

▶ Final figures are available for the copper production of Chile in 1942. As expected, these figures are an all-time high. Chile Copper Co. contributed 47.4 percent to the total, Andes 19.0 percent, Braden 30.0 percent, the Naltagua smelter 1.2 percent, and Chagres 1.6 percent. Thus, if the bar copper production, blister and electrolytic, only is considered, the three American-owned and controlled porphyries account for 97.2 percent and the two French smelters for only 2.8 percent. The remaining copper output of Chile, in the form of concentrates and high-grade ores, which are all exported, amounts only to a figure equivalent to the combined production of the two French smelters.

However, if we analyze statistics from the point of view of the manpower required to produce copper, we get quite a different story. Thus, the large, highly mechanized American-owned mines produce 95 percent of the total copper with 62 percent of the total labor employed in the industry; the French smelters of Chagres and Naltagua, with methods which are not as modern, produce 2.5 percent with 5 percent of the labor, but it takes 33 percent of the total labor force employed in the copper mines of this country to produce the other 2.5 percent of the metal, even without taking the smelting and refining of the latter percentage into account. About 30,000 men are employed in all the copper mines of Chile.

In the American-controlled mines, one man-year produces 28.4 tons of finished copper; in the French smelters a man-year produces only 9.4 tons of blister copper, and in the Chilean owned mines, a man-year produces only 1.5 tons of copper, or at the rate of 10 lb. per man-day. Chile Copper is far ahead of the rest of the American-controlled group, with 34.4 tons of copper per man-year.

▶ From the point of view of taxation and production of credit to enable Chile to pay for its imports there is not, of course, comparison between the advantages Chile draws from the large and very well-equipped American-owned porphyries and the small and old-fashioned-exploited Chilean vein mines, but the latter, such as they are, give steady employment to 10,000 workers and support 40,000 people in the northern desert region, where mining is the only possible means of earning a livehood. From a social point of view, therefore, the small Chilean copper industry is no small asset to the country on account of the large labor force it employs.

▶ The Chuquicamata mine of the Chile Exploration Co. has continued to operate at capacity during recent months. The largest payroll in the mine's history is turning out record tonnages and

production. The company's operations are still largely confined to the treatment of oxide ore from the open pit, although an increasing proportion of mixed ore is being encountered. A tunnel is being driven to drain the upper portion of the deposit below the pit, which in the future will be mined by underground methods.

▶Until the outbreak of the present conflict, manganese exploitation was carried out in Chile in only a very small and sporadic way. Owing to the war and the higher prices obtained for this mineral, manganese mining has been considerably developed and many new deposits are being opened. Although production figures cannot be given, output has broken all previous records and it is hoped that tonnage for 1943 will still be greater than for last year. Since Chilean manganese ores are not easily amenable to concentration by gravity, sink-and-float or flotation, all ores continue to be concentrated by that most ancient and wasteful method,—hand picking.

▶Much higher costs from increased wages and greater prices for all mining supplies are playing havoc with the gold output of Chile. The situation got so serious that recently the government increased the price of bar gold delivered to the Central Bank by 15 percent. However, inasmuch as this higher price has not been extended to producers of concentrates and rich ores, a further curtailment in gold production is expected in mining circles. The greatest decline has occurred in the placers, as, with the much higher wages now prevailing in manufacturing industries and other classes of mining, men have been steadily leaving the placers, which, during the depression, absorbed so many unemployed from the nitrate fields and the copper mines.

▶Special representatives from the Board of Economic Warfare have recently arrived in Chile to look after the supply of machinery and materials urgently needed by the small Chilean mines engaged in the production of strategic minerals. The sale and distribution of supplies to the mines will be made through well-known and long-established American importing houses such as Allis-Chalmers, Grace & Co., Denver Machinery, and others. A special official of the BEW will remain in Chile to accelerate the granting of priorities. According to these officials, about US $200,000 worth of supplies were already on the way to Chile. Mining circles have expressed their gratification with this arrangement, which they hope will ease a critical situation.

American Zinc Purchases Dumas Smelter

EARLY IN APRIL, James A. Hill, president of the Illinois Zinc Co., announced that his company has sold its Dumas, Texas, zinc smelter to the American Zinc, Lead and Smelting Co. for a cash consideration. The purchaser, which has been operating the plant since 1941, exercised an option on March 30. The Dumas plant is now one of the largest in the country.

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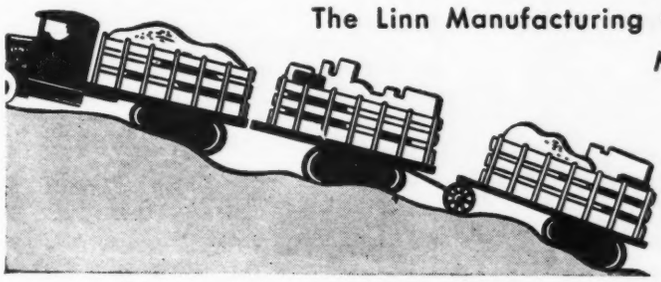

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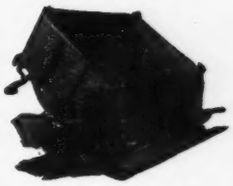

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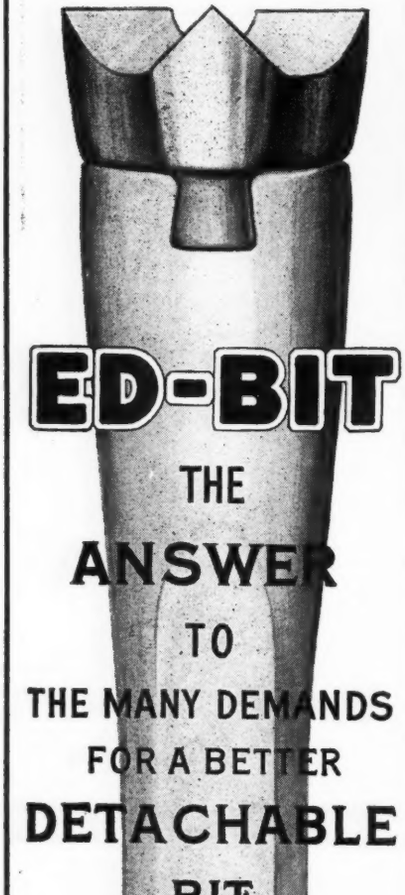

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Sinking crew at West Vlakfontein mine, Witwatersrand

AFRICA

Britain Asks Development of Nchanga Deposit

Rand labor supply improving and production up in March—Gold Coast Consolidated acquires extension holdings—Government may recognize problems of Rhodesian coppers

▶ Nchanga Consolidated Copper Co.'s immense deposit of high-grade copper ore is to be equipped for production forthwith. The British Ministry of Supply has requested it, and will grant the company half the £1,500,000 which is the estimated necessary capital expenditure. Permission has been granted for the company to increase its capital and offer 412,696 of its £1 shares at a price of £1 8s. 6d. each to raise about £588,000. Nchanga's capital is now £5,000,000, of which £4,902,502 in £1 shares is outstanding, and will be increased to £5,350,000. Rhokana Corp., which received 2,000,000 shares of Nchanga when the latter was organized and now owns 2,323,150 shares, will not subscribe for any of the new shares, but its shareholders will be given the privilege of subscribing for one share for each £14 of Rhokana held. The issue is to be underwritten by the Rhodesian Anglo American and Industrial Finance and Investment Corp. for a commission of a shilling per share. Nchanga shareholders may subscribe for four new shares for each £25 held. So the success of the offering is assured. The British government is assuring itself enough copper to carry on the war no matter how long the war may last.

▶ Diamond drilling disclosed 144,000,000 tons of ore in the Nchanga deposit averaging 4.66 percent copper. As a large portion of this is of very high grade, production could go ahead for several years on ores averaging over 10 percent copper. A pilot plant has been in operation for over two years and presumably has solved all the metallurgical problems that existed. At this writing the plans for a plant have not been stated, but because of a large proportion of the ore being carbonates and oxides the details will be awaited with much interest.

▶ Until now the Rhodesian copper companies have financed their steadily increasing productive capacity, to assist the war effort, from their capital reserves without borrowing. Rather more than their addition to earnings seems to have been absorbed by taxation, as dividends paid by the three big producers have all been substantially reduced. There are rumors of a coming concession of excess profits taxation in their favor and of their being allowed a higher price for their copper. The basis of these rumors seems to be the general recognition that the companies are depleting their reserves, developed and equipped at a vast capital outlay, for patriotism rather than for profit. The gesture towards Nchanga indicates that the government's attention has now been directed toward the great service the Rhodesian copper companies are performing.

▶ The February production of the Witwatersrand mines was 1,011,672 oz., of gold. It was 63,082 oz. less than in January and 117,647 oz. less than in February last year. An encouraging feature is that native workers are drifting back to the gold mines. For two or three months past the numbers employed have been increasing, the gain in February being 11,798. When February ended the number of natives was 310,715, compared with 375,923 exactly a year ago, which was the high record of all time. There has been some talk recently of a coming demand for an advance in native wages, the pay of natives employed by the Johannesburg municipality and by the Union railways having been raised. It is computed that an advance of 4d per day, an amount which has been mentioned, would cost the mining companies between £1,500,000 and £2,000,000 a year. The native death roll last year, only 5.3 per 1,000, indicates that the Witwatersrand mines are among the safest places in the world in which to work.

▶Col. E. L. Guest, Southern Rhodesia Minister of Mines, pointed out, when addressing the governors of the Associated Mineworkers, that it is quite impossible now for the government to encourage and assist a vigorous policy of gold exploration. It can only keep the industry alive and in a condition to absorb the men when they return from war. Digby Burnett, acting president of the Rhodesia Chamber of Mines, says 50 percent of Southern Rhodesia's revenue now comes from gold mining. Production has not increased but taxation has multiplied. For instance, Cam and Motor paid 62 percent of its working profit in taxation last year, against 26 percent in 1939. An effort is being made to induce the government to make gold mining development more attractive.

▶Recent surveys have shown that Uganda, probably the most highly developed agriculturally of any considerable native area in Africa, has relatively large deposits of 30 different minerals and smaller ones of 19 others. To aid the war effort, mining of tin, wolfram, and tantalite is being undertaken and will be expanded.

▶Consolidated African Selection Trust, the diamond company formed by A. Chester Beatty in 1924, made a profit of £440,427 the past year, an increase of £89,070. Out of the year's earnings it has paid dividends of 12½ percent, tax-free, against 10 percent, tax-free, each of the three preceding years. Total dividends since organization are believed to have been approximately 700 percent on the original capital, and it has £1,485,593 in cash and government securities. It gives notice of an intention to redeem, on July 31 next, the £189,600 of 5½ percent £1 preference shares outstanding, at 22s. per share. Its sales of gem stones improved in 1942 and the demand for its industrial diamonds increased greatly.

▶Gold Coast Consolidated Lands is purchasing all the assets except cash of West African Mines & Estates. The price is £82,000, which is £2,000 in excess of the latter company's capitalization. West African Mines owns a large farm in Southern Rhodesia, mineral rights over 1,127 acres of coal lands in the Transvaal, a 45 percent interest in areas in Nigeria from which tin, wolfram, lead, and columbite are being mined, and interests in mining and timber lands in the Gold Coast. Gold Coast Consolidated Lands is a small company, £50,000 capital, which has interests in tin and other mining enterprises in West Africa.

▶S. S. Taylor, representing Anglo American Corporation of South Africa, has been appointed a director of Lydenburg Estates. Three other directors indirectly represent Anglo American. Lydenburg Estates owns options and rights on areas in the Orange Free State which are being prospected for gold.

▶Preliminary returns indicate a rather sharp upturn in the fortunes of the Witwatersrand gold mining companies in March. Substantial increases in working profits occur all along the line and two companies, East Geduld and Grootvlei, set up new high records.

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I-T-E and the Mining Field

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Fig. 1

Type KB air circuit breaker for mining service, available for both a-c and d-c circuits.

Developments of the past ten years in mining methods have led to a very wide use of I-T-E air-immersed circuit breakers and switchgear. Consistent study of mining problems has kept I-T-E in the forefront with the result that I-T-E equipment has been a vital factor in mechanized practices. An example of I-T-E efforts to prepare for new needs is the Type KB circuit breaker (Fig. 1)—an extremely compact and rugged circuit breaker capable of meeting a wide variety of service conditions.

Automatic Reclosing Circuit Breakers

I-T-E automatic reclosing circuit breakers with load measuring characteristics are widely used in mines where d-c trolley and feeder systems are employed and where overload peaks and faults arise frequently. Type KSA is for substation use in protecting and controlling semi-automatic or full automatic M-G sets, rotary converters and mercury-arc rectifiers. Type KSC is used in sectionalizing service to localize faults. Sectionalizing provides for maximum production at reduced cost for power, for electrical maintenance and machine repairs.

Fig. 2

Fig. 3

Fig. 2 (above) shows a Type KSA automatic reclosing circuit breaker for substation service. Fig. 3 (right) is a Type KSC automatic reclosing circuit breaker for sectionalizing service. Steel enclosure is open.

Automatic Switchboards For Mines

I-T-E has designed and built many switchboards in recent years for semi-automatic or full-automatic protection and control in connection with local generating systems or purchased energy. The switchboards are for service with M-G sets, rotary converters and mercury-arc rectifiers. Much of the equipment, including circuit breakers and protective relays, has been designed specifically for mining service. Mounting is simplified and there is much flexibility in space arrangements. A typical installation is at right, above. (Fig. 4.)

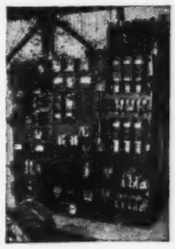

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Fig. 5

Type LDR Load Distributor, panel mounted, in glass front, dust-proof cover.

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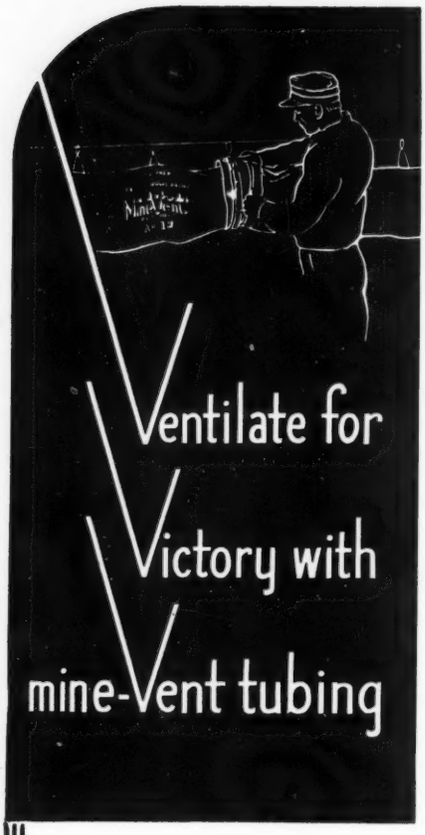

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AUSTRALIA

Broken Hill Will Produce For Several Decades

Called world's greatest silver-lead-zinc deposit—Reports on Boulder Perseverance, Kalgoorlie Enterprise, Zinc Corp., and Broken Hill Consolidated

WESTERN AUSTRALIA

▶ Accounts of Boulder Perseverance, Ltd., for the year ended Dec. 31, 1941, show a profit of £Stg.132,490 after provision for depreciation and taxation. The profit was £Stg.65,121, from which dividends amounting to £Stg.44,964 were paid. In the year under review the troubles which now affect the gold mining industry were only in their infancy, so that a good showing was made for the period. The mine is in the central position on the Golden Mile, with the property of Lake View and Star to the south, Great Boulder Proprietary Gold Mines on the west, and South Kalgurli Consolidated on the north end of the leases. On the eastern side is the old Associated mine, now being worked in the Lake View group, and beyond is the property of Gold Mines of Kalgoorlie Ltd. The quantity of ore treated was 120,923 long tons, averaging 6.614 dwt. per ton, which yielded a revenue of £A372,412. Mine development totaled 6,291 ft., which included 3,712 ft. of driving and 2,361 ft. of winzing. Results were very satisfactory. Ore reserves were reckoned at 554,000 tons, averaging 6.05 dwt. Costs per long ton, in Australian currency, were distributed as follows:

Cost per Long Ton	s.	d.
Ore production	17	4.78
Development and diamond drilling	5	0.07
Other expenses	1	6.00
Treatment costs	12	8.15
Total	36	7.00

▶ Most of the ore is broken by shrinkage stoping. Treatment is carried out at the mill of Kalgurli Ore Treatment Co., in which the Boulder Perseverance Co. is largely interested, the other shareholder being Kalgoorlie Enterprise Mines, Ltd., which is managed by the Perseverance Co.

▶ The property of Kalgoorlie Enterprise Mines, Ltd., lies to the west-northwest of the Boulder Perseverance mine, to which it is connected by a crosscut at the 2,050-ft. level, driven through the lease of South Kalgurli Consolidated, Ltd. Ore is hauled up the Victoria shaft on the Enterprise lease and transported by motor truck to the treatment plant. For the year ended Dec. 31, 1941, the company produced 70,379 tons of ore of an average grade of 6.831 dwt. per ton, an increase of 0.184 dwt. compared with ore treated in the previous year. Ore reserves were 424,000 long tons, averaging 6.26 dwt. per ton. Development work totaled 4,745 ft. with an additional 227 ft. of shaft sinking, the Victoria shaft being sunk to a total dept of 2,041 ft. below the collar and connection made to the crosscut from the Boulder Perseverance mine. Diamond drilling amounted to 8,615 ft. Detailed working costs, also in Australian currency, were:

Cost per Long Ton	s.	d.
Ore production	16	4.31
Development and diamond drilling	7	9.85
Ore transport	0	2.86
Other expenses	1	11.08
Treatment	12	7.53
Total	38	11.63

NEW SOUTH WALES

▶ The Zinc Corp., Ltd., which is situated at the south end of the Broken Hill line of lode, earned a net profit of £Stg.139,157, in the year ended Dec. 31, 1942, after providing £254,869 for mining royalty and taxation in Australia and England, as well as making provision for depreciation, shaft sinking, and special development. All branches of mining operations showed satisfactory results. The ore reserves in the lead lode were increased to 3,800,000 tons, against 3,650,000 tons at the end of the previous twelve months, and the grade was maintained. Ore mined during the year totaled 535,443 tons, most of which came from above No. 14 level. The new Main shaft had reached No. 18 level and Nos. 15, 16, and 17 levels were being opened up. No. 16 level, at a vertical depth of 2,280 ft., was developed to a point justifying the statement that it would produce 2,000,000 tons of ore. Preliminary development at No. 17 level, 2,440 ft., has also been satisfactory, and exploratory diamond drilling has indicated the presence of good values and widths in the broad lead lode at depths considerably greater than those now being worked. The mill did excellent work, and metallurgical results in every phase showed a further improvement on the high standard set in the previous year. Costs have benefited very considerably from the new equipment but were affected by heavy increases in the price of stores and increased wages rates. Safety measures have secured a marked reduction in accidents. Besides community efforts in conjunction with the other Broken Hill companies, the Zinc Corp. has a cooperative housing society through which 65 employees have secured their own homes. A library has been added to the mess hall. A novel feature of the company's work, and one which has greatly modified the dust invading the mine vicinity and adjacent suburbs of the town is the covering of the large tailings dump with a layer of clay.

▶ The leases of New Broken Hill Consolidated, Ltd., adjoin those of the Zinc Corp., Ltd., on the south and the control and management are carried out by the latter company. In the year ended Dec. 31, 1942, active de-

velopment was continued. The circular airway has been completed to a vertical depth of 2,650 ft.; it is concrete lined throughout and is 13 ft. in diameter. It is situated 1,000 ft. south of the Zinc Corp. boundary and connection has been made from the airway to the boundary winze on the 1,700-ft. level. This winze has reached a depth of 2,300 ft. vertical. The southern workings of the Zinc Corp. have been extended to the Broken Hill Consolidated boundary and the 14th, (1,960 ft.) and 15th (2,120 ft.) levels and connections with the airway are now being driven. A considerable amount of exploratory work as well as development diamond drilling has been carried out, and it is anticipated that profitable production will be realized. The company's policy has been one of closest cooperation with the Zinc Corp. in management, operations, and equipment, and the arrangement has been advantageous. The first part of the arrangement provided for the use of the Zinc Corp. shaft, underground openings and equipment, mill and surface equipment, toward which capital contributions were to be made. The second part provided for a joint production policy, and the time has almost arrived when this second part of the program will be put into force.

W. S. Robinson, who is managing director of the Zinc Corporation, Ltd., and also a director of New Broken Hill Consolidated, Ltd., has made an important statement on the future of Broken Hill, following a recent visit of inspection to the field. He said that developments in both mines have been most satisfactory and have established beyond doubt that Broken Hill is the greatest silver-lead-zinc deposit in the world. On the present basis of output, Broken Hill is assured of a life of more than 50 years. This view is most encouraging to mining at the two extremes of the line of lode, for at the south end these two companies have established the importance of the lode to a dept of 3,000 ft. and at the north end, North Broken Hill, Ltd., has proved by diamond drilling that there is no change in the characteristics of the lode at a vertical depth of 2,970 ft. The field has been in continuuus operation since 1883, and although the number of mines has now decreased, owing to the exhaustion of those in the central part of the line of lode, a great future appears to be before those companies working on the northward and southward pitch of the orebody. The mines of Broken Hill Proprietary, Broken Hill Block 10, and the Sulphide Corp. are now merely matters of history, after working out their portions of the orebody from the shallow crown of the arch to increasing depths on the southerly pitch, and Block 14, on the northerly pitch, has now been taken over by North Broken Hill, Ltd., for its remaining 200,000 tons of ore. A diamond drilling campaign was undertaken by the Broken Hill Proprietary Co. prior to finally closing down, to test for a repetition of the mineralized beds at a depth of some 3,000 ft., but the work was unsuccessful and the future of the field is, therefore, confined to the extreme ends of the lode.

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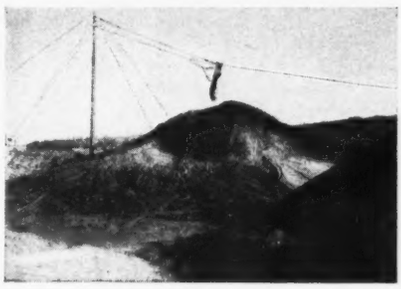
This Picture Shows a Small Sauerman Scraper Reclaiming Mine Screenings from Waste Pile to Washing Plant.



Sauerman Slackline Cableway with ¾ cu. yd. bucket strips placer ground ahead of dredge in Alaska.

Important savings in man-hours are being made in open-pit mining and stockpiling by the use of SAUERMAN Drag Scrapers or Cableways. All of these savings contribute directly to the war effort.

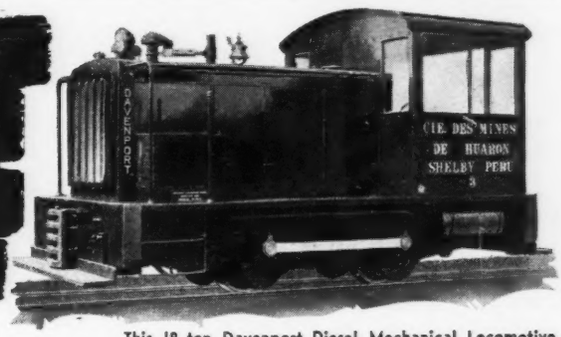
When you use a SAUERMAN machine to handle materials you not only conserve labor and power, but also it is more than likely you will save yourself some money. For these machines are moderate in first cost and demand little by way of repairs.

Many typical projects where materials are being excavated, hauled and placed at costs as low as 2¢ per ton are pictured and described in our latest catalog. Some of these jobs involve daily capacities of less than 100 tons; others require handling thousands of tons per day. If you are at all interested in the subject of long range material-handling, you should write for a free copy of this Sauerman booklet.

SAUERMAN BROS., INC.

584 CLINTON ST. CHICAGO, ILL.

POWER WHEN and WHERE You NEED it



This 18 ton Davenport Diesel Mechanical Locomotive is serving a Peruvian mine at 14,000 feet elevation.

DAVENPORT LOCOMOTIVES — Builders of the World

STEAM • GASOLINE • DIESEL LOCOMOTIVES MECHANICAL or ELECTRIC DRIVE

Mining is profitable only when the spread between costs of production and the current market justifies operation. Knowing this, we urge you to consider the Dependability and Efficiency of Davenport Locomotives as a direct aid in furthering production while keeping haulage costs down. Davenports are Stamina-Built. They can be relied upon for hard, continuous service with a minimum of interruptions. There is a size and type of Davenport exactly suited to your operations—ready to render the same high standard of service for which our power units have been famous for more than forty years. As you plan ahead, investigate the merits of Davenport Better-Built Locomotives.

Fendremos mucho gusto en enviarle un catalogo en Espanol, describiendo las Locomotoras Davenport.

Analysis of your needs and reliable recommendations gladly furnished without obligation.

EXPORT OFFICE **BROWN & SITES** 50 Church St., New York Cable Address "Brosites"

DAVENPORT LOCOMOTIVE WORKS

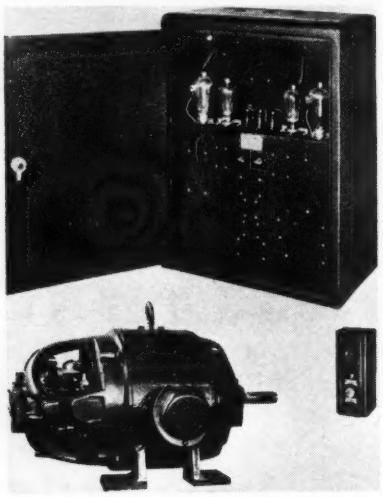
A DIVISION OF DAVENPORT BESLER CORPORATION, DAVENPORT, IOWA

ESTABLISHED IN 1900

Equipment News

Electronic Control for Motor Speed Regulation

USERS of a.c. electric motors who wish to obtain the desirable speed-control characteristics of d.c. motors without the necessity of installing a source of d.c. power may do so by using a d.c. motor connected to the regular a.c. power source through the new Mot-O-Trol electronic drive control recently announced by Westinghouse Electric & Mfg. Co.



Features of the new drive include: stepless speed control; automatic, close speed regulation over wide load fluctuations; full torque at extremely low speeds; smooth, stepless acceleration and deceleration; and dynamic braking. Four parts are required, three of which are shown in the accompanying illustration. These are: a power transformer, Mot-O-Trol cabinet with thyratron tubes and current and speed controls, push-button control station with potentiometer for varying armature and field voltage, and a shunt-wound d.c. motor.

At present a standard drive is available for ratings up to 1 hp. for use with single-phase, 110 to 220 v., 60-cycle systems. Special drives of greater power can be designed. Further information can be obtained from Dept. 7-N-20, Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

Reinforced V-Belts

GREATER horsepower capacity, increased tensile strength, and low stretch are said to be features of a new wire-reinforced V-belt recently announced by B. F. Goodrich Co., Akron, Ohio. Two types are being built: a cable-cord construction, and a grommet construction which incorporates a wire cord placed in the center of a cotton or rayon grommet. The company emphasizes, however, that the practicability of these belts must be decided for each installation after careful study of proposed operating details.

Air-Cooled Electrode Holder

HEAVY metallic arc welding jobs around mines can be rendered easier, it is said, by use of air-cooled electrode holder available from Jackson Products, Detroit, Mich. The intense heat set up by using rods as heavy as ½ in. is dissipated by air under 3- to 4-lb. pressure introduced into, and traveling the entire length of, the lower tong. An air inlet tube is provided for connection to the plant air line.

INDUSTRIAL NOTES

Army-Navy "E" awards for excellence in the production of war materials have recently been given to the following plants: **Kensington Steel Co.**, Chicago, Ill.; **General Electric Co.**, Bridgeport, Conn.; **American Cast Iron Pipe Co.**, Birmingham, Ala.; **Foote Bros. Gear & Machine Co.**, Chicago, Ill.; **Manning, Maxwell & Moore, Inc.**, Boston, Mass. and Bridgeport, Conn. Stars were added to the "E" flags of: **Storage Battery Division, Philco Corp.**, Philadelphia, Pa.; **Kropp Forge Co.**, Chicago, Ill.; **Westinghouse Electric & Mfg. Co.**, East Pittsburgh, Pa.; and **Electric Storage Battery Co.**, Philadelphia, Pa.

Robins Conveying Belt Co., Passaic, N. J., annouonces the shortening of the company name to **Robins Conveyors, Inc.**

Ernest Smith, for the past 17 years manager of the Oruro, Bolivia, office of **Allis-Chalmers Mfg. Co.**, has been transferred to Bogota, Colombia, as the company's manager for Colombia and Venezuela. His office is in the Edificio Banco Bogota.

Thomas N. Armstrong, metallurgist with **International Nickel Co.**, has become a part-time member of the **War** Metallurgy Committee of the National Academy of Sciences. **LeRoy L. Wyman,** metallurgist with **General Electric Co.**, has also joined the staff of the committee.

Link-Belt Co., Chicago, Ill., announces the promotion of **Frank S. O'Neil,** general manager of the company's Indianapolis operations, to the position of vice-president.

Neil C. Hurley, Jr., was recently elected executive vice president of **Independent Pneumatic Tool Co.**, Chicago, Ill.

Eimco Corp., Salt Lake City, Utah, announces the establishment of complete filtration laboratory service at the company's office at 111 West Washington St., Chicago, Ill. **Paul Richter** is now in charge of the filtration equipment department.

Western Machinery Co., San Francisco, Calif., has established resident representatives in New York and Chicago. **Herman Daniels** will head the New York office at 50 Church St., **Charles Skinner** will serve as traveling representative in the Midwest, and **A. E. Chapin** will open an office at 823 Colorado Bldg., Washington, D. C.

Ben F. Lease has been made domestic sales manager of **Athey Truss Wheel Co.**, Chicago, Ill.

Euclid Road Machinery Co., Cleveland, Ohio, announces that **Virgil E. Snow,** assistant chief engineer, has been assigned to work with mining companies and quarries in the application and maintenance of Euclid equipment.

Ralph K. Gottshall has been appointed director of sales of the explosives department of **Atlas Powder Co.**, Wilmington, Del.

M. W. Heinritz has been named vice president in charge of the storage battery division of **Philco Corp.**, Philadelphia, Pa.

BULLETINS

Shift Planning. The problem of obtaining maximum working hours per week in three-shift plant operation, together with proper rest periods and minimum overtime per man, may be solved by a shift rapid calculator devised and prepared for free distribution by George S. May Co., 2600 North Shore Ave., Chicago, Ill.

Pipe Welding. Gas welding of piping is discussed in a new bulletin of Air Reduction Co., New York, N. Y. Also available on request is a color chart showing characteristics of various acetylene flame conditions.

Magnetic Separators. Dings Magnetic Separator Co., Milwaukee, Wis., has issued a new catalog describing magnetic-separation equipment in use for concentrating magnetite and for cleaning ferrosilicon media in heavy-density plants.

Conservation. Recommendations for saving critical materials in the selection and use of electrical equipment are given in a new booklet published by Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

Adjustable V-belts. A complete catalog of adjustable link V-belts, including an instruction manual for their use, is offered by Manheim Mfg. & Belting Co., Manheim, Pa.

Battery Charging. Automatic storage-battery charging equipment is the subject of a new 8-page bulletin recently issued by General Electric Co., Schenectady, N. Y.

Motor Control. Fundamentals of electric motor control are described in a new 16-page manual of General Electric Co., together with suggestions on the selection and application of various motor-control devices.

Electric Steel Castings. Eimco Corp., Salt Lake City, Utah, has published a bulletin, No. 801, describing in detail the manufacture and application of electric-furnace steel castings, together with methods of heat treating, tempering, and machining them.

Blow Torches. Turner Brass Works, Sycamore, Ill., now has for distribution a series of pamphlets on the proper use and care of blow torches.

PHILCO "XL" BATTERIES

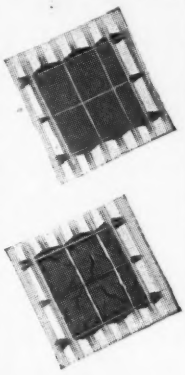
GIVE YOU GREATER TONNAGE PER BATTERY!

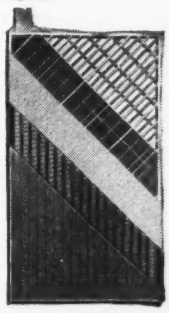
10% GREATER CAPACITY...SUSTAINED HIGH VOLTAGE...LONG PRODUCTIVE LIFE

PHILCO "K" PROCESS

(Upper right) Philco "K" Process produces a flint-hard, porous plate with superior bond between active material and grid.

(Lower right) Ordinary plate drying. Active material contracts unevenly and away from grid, cracking on surface, and leaving center impervious to liquid.





PHILCO TRIPLE INSULATION

(Left) Philco Triple Insulation adds months of service by sealing active material into grid with Glass Fibre Mats, Slotted Rubber Retainers, rugged Philco Separators.

With the 10% extra capacity, Philco XL Batteries give you, every charge lasts 10% longer! You get more work out of your locomotives! To meet today's demand for greater tonnage, now—more than ever before—you need the extra capacity, sustained high voltage, low maintenance and long life of rugged, heavy duty Philco Batteries. Use the coupon.

PHILCO CORPORATION, STORAGE BATTERY DIVISION, TRENTON, N. J.

PHILCO CORPORATION, Storage Battery Division, Trenton, N. J.

Send me new, free Philco Mine Battery Catalog.

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COMPANY_____

ADDRESS_____

REPLACE WITH RUGGED, PHILCO MINE BATTERIES!

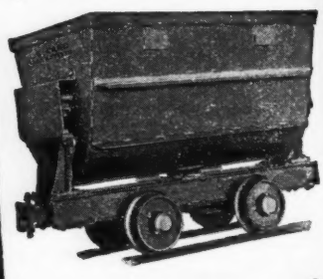
CARD CARS

A . . . designed to meet specific haulage conditions in each mine.

A GET A PLUS IN CAR CAPACITY

One major aim of CARD design is to step up the capacity of the car without adding to overall size. In many cases we have added 10, 15, even 20% to pay loads.

A Let's get together and lick your own haulage problems.



Ask for Card Catalog No. 40

A

C.S. Card Iron Works Co.
Denver, Colorado

Reflections From Washington

(*Continued from page 55*)

been pointed out that the publication of the "hold the line" order marks the first time that labor leaders have not had previous notice of a move that drastically affects labor and been given opportunity to voice their objections prior to its publication.

Zinc Division Resignations

DURING APRIL the Zinc Division of WPB lost its two top executives. The resignation of Walter C. Page, deputy director, was announced April 20, as was the appointment of his successor, Platt C. Benedict. Mr. Benedict came to Washington last January from the Newmont Mining Co., to join the technical staff of the Material and Equipment Requirements Branch of the Facilities Bureau, where he was primarily concerned with equipment requirements of new mining projects.

Before the end of the month the resignation of George Heikes, director of the Zinc Division, was announced. No successor to Mr. Heikes had been named up to the first of May. Mr. Heikes resigned to become affiliated with Kalunite, Inc., which operates DPC plants in Utah and Washington, manufacturing aluminum from Utah alunite.

Page left Washington to assume the position as assistant to F. S. Mulock, vice president and general manager of Western operations of the United States Smelting, Refining & Mining Co., with headquarters at Salt Lake City.

Neither of these resignations was motivated by disaffection or discontent.

Manpower Maneuvering

TO SAY that the rules laid down by Manpower Commissioner McNutt governing job transfers irk labor is putting it mildly. And there is no doubt that the role he must play also irks politically conscious Paul McNutt. The manpower boss took pains to point out, when he issued WMC Regulation No. 4 restricting the transfer of workers, that the President's order left him no choice. The language of Section 3 of the executive order is clear and to the point. It reads: "The chairman of the War Manpower Commission is authorized to forbid the employment by any employer of any new employees or the acceptance of employment by a new employee except as authorized in accordance with regulations which may be issued by the chairman of the War Manpower Commission, with the approval of the economic stabilization director, for the purpose of preventing such employment at a wage or salary higher than that received by such new employee in his last employment unless the change of employment would aid in the effective prosecution of the war."

The new rules permit the movement of workers from non-essential industries to essential industries, but prevent shifts from essential industries to non-essential industries, or from essential industries to essential industries for higher wages, if the worker has been employed in an essential activity during the preceding 30-day period.

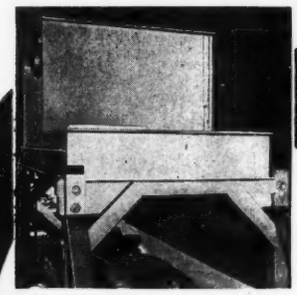
In areas where WMC approved employment stabilization programs are in effect, employers may hire new workers without restriction on wages paid if such hiring is permitted under the program. The 12 Western non-ferrous metal mining states affected by the freezing order of August, 1942, constitute an area where such a program is in effect.

On May 1 there were 67 employment stabilization programs in effect and the War Manpower Commission expected to have every industrialized community covered soon.

The revised list of essential industries and activities issued simultaneously with WMC Regulation No. 4 includes the metallic and non-metallic mining industries under three headings as follows:

Metal Mining: The mining of iron, copper, lead, zinc, aluminum, mercury, manganese, chromium, molybdenum, tungsten, vanadium, and similar ores,

MERRICK WEIGHTOMETER



AUTOMATIC WEIGHING WITHOUT PAUSE IN CONVEYING!

The Merrick Weightometer provides a continuous, automatic accurate weight record while material is in motion on conveyor. It weighs without interrupting conveyor service.

Applicable to any size belt conveyor, horizontal or inclined. An accurate and dependable means of keeping constant check on production.

Write for Bulletin 375

MERRICK SCALE MFG. CO.
PASSAIC, NEW JERSEY, U.S.A.

and the dressing of such ores. Includes also removing overburden, sinking shafts, and other such activities preparatory to metal-mining operations.

Non-metallic Mining, Processing, and Quarrying: The mining and processing of rock salt, phosphate rock, sulphur, potash, asbestos, graphite, pyrites, graphite, borates and other salines, fluorspar, mica, talc, abrasive sands, and similar products. Excludes all mined or quarried non-metallic materials used exclusively in construction.

Smelting, Refining, and Rolling of Metal: Primary and secondary smelting and refining, alloying, rolling, and drawing of iron, steel, copper, lead, zinc, magnesium, aluminum, brass, bronze, nickel, tin, cadmium, ferroalloys, and any other metals used in the production of war materials; and scrap salvage.

New Mica Association

MICA MINERS from the states of New Hampshire, Connecticut, Virginia, North Carolina, South Carolina, and Georgia are organizing themselves into the Mica Miners Association, which will have as its objective the rewriting of the specifications upon which mica is purchased. It is the desire of the producers to sell mica on a technical basis, with some method of testing each individual piece for its dielectric properties. The old India standards upon which purchases have been made depend on personal opinion and a rule of thumb. These standards have a long tradition behind them, but no scientific basis. The dielectric properties of a badly stained piece of mica may be well within the limits that permit its use. The organization is setting out with the blessing of the governors of five of the states in which mica is commonly mined and the aid of the technical organizations devoted to mining in each of these states has also been enlisted. The mine operators are raising money to obtain their objectives.

The big problem of the producers is to find a method of testing the mica commercially. A project to develop apparatus for the purpose was sponsored by WPB about eight months ago, but to date nothing has come of it.

Even if equipment to test the dielectric strength and to determine the power factor were available, however, there would still be other properties of mica that would have to be evaluated by personal opinion. The characteristic known as splitability is one of these. Some mica tends to stick together more than others and does not peel off in perfect laminations. Some of the flaws that may be present are also subject to visual inspection.

There has been no secret about the uses of mica, where it comes from or of the essentiality of the material. The Tariff Commission report No. 130 "The Mica Industry," gives all the basic facts and the uses of mica with the possible exception of a few of the later military devices. No synthetic material has been produced to take the place of the natural product.

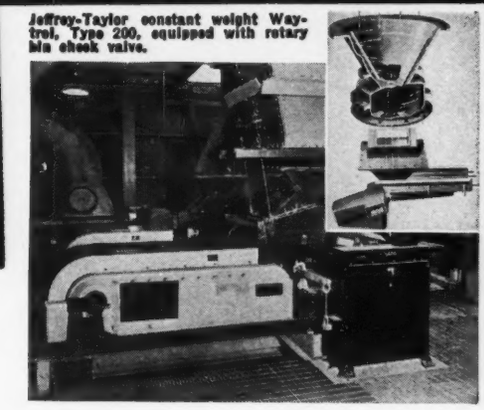
Mica Substitutes

SOME MATERIALS have been developed that have a few of the properties of mica. One of these is Polectron, the trade name for a polyvinyl carbazole, a synthetic resin developed by the General Aniline & Film Corp. A high-grade kraft paper impregnated with polyvinyl carbazole and called Promika can replace mica in limited applications. But mica miners need have no fear that some substitute material is going to run off with their market.

As excellent as Promika is in the applications to which it is adapted, it does not have the characteristics necessary to replace mica. For instance, Promika fails at about 300 deg. F., whereas mica remains unaffected at temperatures as high as 1,000 deg. F. Dielectric tests show that Promika fails at about 2,000 volts per mil; mica fails at from 5,000 to 5,500 volts per mil. According to present information, natural mica still has a slight edge in the matter of cost, but this could change overnight with a change in manufacturing conditions.

JEFFREY-TRAYLOR ELECTRIC VIBRATION

...A PRINCIPLE THAT SPELLS *Lower Cost Material Handling!*



Jeffrey-Taylor constant weight Waytrol, Type 200, equipped with rotary bin check valve.

AS AN EXAMPLE . . . BETTER CRUSHING RESULTS FROM THIS ALL - ELECTRIC BIN-CHECKED WEIGH FEEDER.

• Uniform feed gives greater efficiency in the operation of reduction units . . . that's why Jeffrey-Traylor weigh feeders and rotary bin valves (patented) have steadily lowered costs in this phase of metal mine service. By high frequency electric vibration, a uniform head of material is always available . . . this, in turn, is controlled by the "electric brain" of the Waytrol thus assuring a constant, positive feed for ball mills, crushers, etc. This sound principle of electric vibration, plus electric control, is a feature of J-T screens, feeders and conveyors. Let us demonstrate the many benefits with a system that's entirely electrical. Write for Catalog No. 650-J.

JEFFREY-TRAYLOR DIVISION
The JEFFREY MANUFACTURING Company
974-99 NORTH FOURTH STREET . . . COLUMBUS, OHIO

ROSS FEEDER

Completely Controls

the flow of any size material from Storage Bins, Hoppers or Open-Dump Chutes to Crushers, Conveyors, Screens, etc.

High in efficiency. Low in maintenance and power consumption.

Furnished in sizes to suit your operation. Scalping unit to fit your chute if desired. Send full particulars for recommendation.

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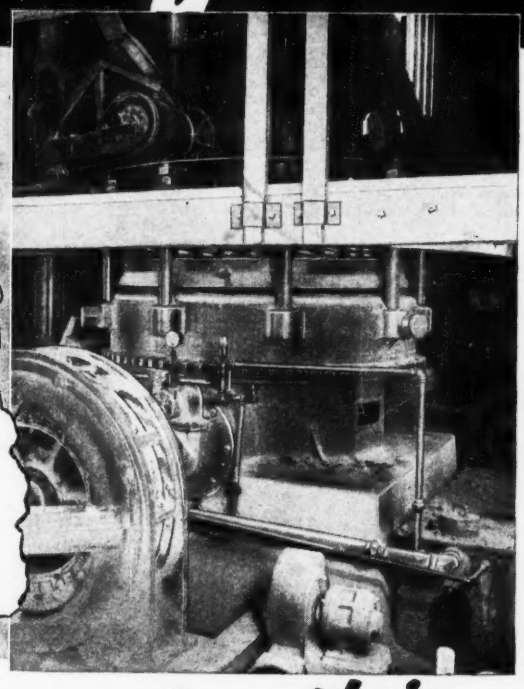
THESE THREE SABOTEURS *failed!*

"We are sending you under separate cover, one eight pound hammer head and two picks which passed through our Secondary Crusher on Sept. 18, 1942, without apparently doing any damage.

This is such a remarkable demonstration of the power and efficiency of your 48" TELSMITH Gyrasphere Secondary Crusher, that we feel you should have these specimens as proof of the statement. This machine at the time was set for one-half inch discharge, which makes the demonstration more remarkable.

We get a large percentage of tramp iron * * * In the past this was a source of grave trouble but since installing your machine tramp iron doesn't bother us."

● NAME ON REQUEST



they didn't even stop this

TELSMITH

Gyrasphere SECONDARY CRUSHER

A silent, skulking saboteur—Tramp Iron constantly menaces your production. Get the insurance against shut-downs of Telsmith's *spring relief*. The crusher's concave bowl is backed by heavy springs, adjustable as to compression. When tramp iron gets in, it causes undue pressure in the crushing bowl. The springs let the concave bowl *tilt* at the point of stress. The pressure is relieved. The concave resumes its normal position. Crushing goes on as usual. The same relief is afforded when crusher bowl is packed by fines. This means a greatly increased capacity in fine crushing, continuous operation and minimum upkeep. *For the whole story, get Bulletin Y-1.*

Y-3

SMITH ENGINEERING WORKS, 502 E. CAPITOL DRIVE, MILWAUKEE, WISCONSIN

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